AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 440 Fourth Avenue, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

Volume XIX | NEW YORK, MARCH 31, 1930 | Number 6

Notes On the Use and Construction of Dyeing Machines

DYE JIGS FOR PIECE GOODS

By **A. J. HALL, B.Sc., F.I.C., F.T.I.**

THE history of the dye jig—often known as the Lancashire jigger—goes back to the very early days of dyeing fabrics, yet even to-day it is too much to say that it is the most important of dyeing machines. It is the one indispensable machine to be found in every piece goods dye house. During the past few years it has been improved in many respects and several new types are available yet it still retains many characteristic disadvantages. In this article it is intended to point out by reference to its construction and performance the main advantages and disadvantages of a jig and further indicate the chief points by which practical dyers can determine its suitability or otherwise for the various types of fabric which in turn become popular. This critical review of the utility of a dye jig is of course based on the writer's personal experience and as such opinions as are given may differ from those of others in the dyeing industry; its value should not be any less on that account.

Most of the essentials of a jig are shown in Fig. 1. It consists of a V-shaped tank K over which are mounted the draw-rollers A and B, and within which are the guiding rollers C, D, E, and F. Dye liquor is added to the tank K so that there is at least sufficient to cover the bottom rollers E and F, and the fabrics are dyed while being drawn backwards and forwards from one draw roller to the other. Tank K is usually erected so that one end is slightly lower than the other; this lower end contains the dye liquor outlet so that complete drainage of dye liquor occurs on emptying the tank.

Since dyeing is usually carried out at all temperatures from cold to boiling, it is necessary to provide a jig with heating arrangements. These may take the form of a closed steam coil or a perforated pipe fitted along the bottom of the jig, but the latter is almost universally adopted. That is, heating is effected by blowing live steam into the dye liquor.

Before turning to the dyeing operations it may be pointed out that these simple accessories—outlets and heating devices—are not so simple that they require no consideration by the jig designer. The writer has frequently met with jigs having a very small outlet. It must be remembered that in the course of dyeing and other treatment of piece goods in a jig the emptying and refilling of the jig with liquor is very frequent, and the operative is paid for dyeing not for watching a liquor to pass through a small outlet. Consequently the outlet of the jig should be as large as possible—the larger the better, provided that it does not leak. Further, the means for controlling it should be easy to get at. The method by which the operative crawls round one end of the jig to knock out a wooden bung covered with rag should be obsolete though it is far from being so.

When the heating device consists of a simple perforated iron or stainless metal pipe running along the bottom of the jig, it is evident that condensation of the incoming steam necessarily increases the volume of the dye liquor. When the dyeing operation is prolonged this increase is often considerable and objectionable, but nevertheless it is doubtful if this disadvantage is such as to warrant the use of a closed steam coil since this latter is less efficient and the heat exchange is slow. An essential point, however, is that the connection of the perforated pipe to the main steam supply mains should be such that condensation in the mains is trapped so that it does not pass with the steam into the jig; dilution of a dye liquor by condensed steam in the mains may be much greater than that produced by the heating of the dye liquor. As a matter of fact a great deal of time on the part of the operative can be saved by having a hot water pipe line connected to each jig; the amount of heating and the time taken for this can thus be very much reduced. Frequently the hot water can be obtained by making use of waste and exhaust steam available in other parts of the dye works.

The perforations in the heating pipe should be care-

fully arranged along its length so as to equalize distribution of the incoming steam. Moreover, it is better to have two parallel rows of perforations as shown at A and B in Fig. 2a rather than one row as shown at A in Fig. 2b. There is a simple reason for this. It is frequently necessary to heat the dye liquor during the passage of the fabric through the dye liquor in the process of dyeing, and it is obvious that the steam must not blow on to the fabric. The perforated pipe is of course placed in the jig permanently below the level of the fabric while passing below guiding rollers E and F (Fig. 1). When there are two rows of perforations the steam is equally distributed below rollers E and F. If, however, only one

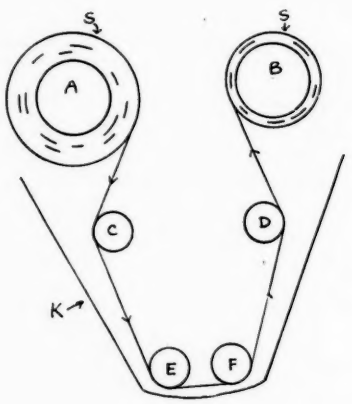

Figure 1

row of perforations is present the steam blows through these perforations vertically downwards and any slight displacement of the pipe may cause the steam to be directed entirely under roller E or F; this distribution is not desirable. It is for this reason that the doubly perforated pipe is preferable.

Returning now to the dyeing process it must be at once pointed out that a main feature of the jig is that the fabric being dyed is *pulled* from one draw-roller to the other so that the fabric must be subject to the consequent tension and stretching thereby produced. This tension is of the greatest importance and deserves the greatest consideration since on it often depends success in dyeing goods so that they ultimately have not only the desired color but also the desired *finish*. The effect of treatment in a jig on the finish of a fabric is often overlooked; this will be referred to later in connection with types of fabrics.

The tension involved in the working of a jig is of two distinct kinds—static and dynamic. By static tension is to be understood the pull on the fabric involved in starting; by dynamic tension is to be understood the tension produced during the running of the fabric during dyeing. So far it has proved almost impossible to avoid either of these types of tension, but devices have been discovered so that they can be better controlled.

Static tension is particularly to be avoided since in many cases it may amount to a sudden snatch on the fabric sufficient to tear it. On the old-fashioned jigs starting is effected by means of a simple "dog" clutch which can be made to engage with a main rotating shaft; the clutch is engaged by pushing forward a lever and the draw-roller *instantly* commences to rotate and draw on to it fabric from the other draw-roller. Now the amount of fabric which can be dyed or treated in one operation may amount to more than 200 lbs. (this is wet fabric) so that on starting the jig with such a simple type of clutch the pull on the fabric must be sufficient to suddenly set this in motion from rest to the full speed of the jig. This pull is obviously very great and though it can generally be withstood by plain cotton fabrics there is very great risk of damage in the case of artificial silk fabrics. Hence, in the modern jig it has become usual to fit a type of friction clutch so that starting can be effected gradually. Such clutches vary in construction but they are usually based on the principle of transmitting the drive to the draw-roller through two surfaces capable of sliding over each other until pressed together by a cam or other such motion which can be operated gradually. The starting of the jig can thus be produced very gently and all snatching of the fabric avoided. For the successful dyeing of piece goods consisting entirely of artificial silk it is almost impossible to use a jig not fitted with a friction clutch.

Dynamic tension is largely concerned with the type of fabric being dyed, the amount of fabric on the draw-rollers, and the nature of the bearings of the draw-rollers and guide rollers. Obviously, if the bearings are stiff the tension is largely independent of all other considerations. Ball bearings have given a great deal of trouble because of the fact that it is practically impossible to prevent their contact with the liquor in the jig—liquor which may be acid, alkaline, and neutral. Experience has shown that stainless steel ball bearings give reasonably satisfactory results. The rollers in the jig should be as light as possible so that the amount of energy required to commence their rotation is the minimum.

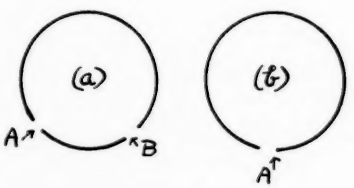

Figure 2

In considering the pull on the fabric due to the fact that one draw-roller transmits its motion to the other draw-roller through the fabric it is important to realize that the speed of the fabric through the jig is not constant. At the commencement of an "end" (a passage of the fabric through the dye liquor) the diameter of the draw-roller and the fabric upon it is comparatively small, but as the roller winds on to itself more and more fabric

so does its diameter increase and the fabric is thus drawn faster and faster from the other draw-roller and through the liquor. It follows that as a result of these conditions the tension on the fabric varies considerably, and the variations will depend on the amount of fabric being dyed.

The dynamic tension is also dependent on that intentionally applied by the operative and this is in general dependent on the type of fabric being dyed. Some types tend to crease badly during continued passing backwards and forwards through the dye liquor; usually such creasing becomes greater and greater with continued running and should therefore be corrected at an early stage or the creases formed become dyed more deeply than the uncreased parts. Fabrics having stripe or check effects are particularly prone to creasing. Experience shows however that this creasing can often be effectually prevented by increasing the tension on the fabric and this can be accomplished by retarding the draw-roller from which the fabric is being drawn. A simple method for doing this is shown in Fig. 3. A and B are the draw-rollers and

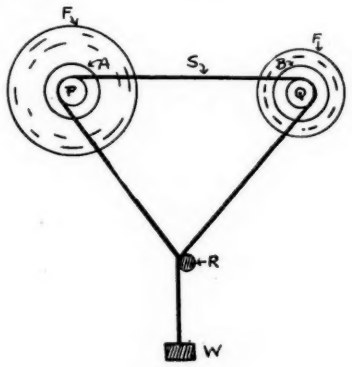

Figure 3

fabric F is being drawn from A and wound upon B. P and Q are small pulley wheels, each of about 6 inches diameter, keyed on to the shafts of A and B. A strap S secured to rod R passes over pulleys and then hangs over rod R maintained taut by means of weight W attached to it. It is obvious that the friction between the strap and the pulley retards the rotation of draw-roller A and this retardation can be increased or decreased by adjustment of the weight W. When the fabric is travelling in the opposite direction the friction strap S is transferred to the pulley connected to draw-roller B. There are several other devices equally simple and effective.

Sometimes creasing of the fabric during dyeing must be avoided by other methods than those employing excessive tension. In such cases use may be made of a curved bar expander or a wooden spreading roller.

The construction of a suitable curved bar expander is shown in Fig. 4. It consists of a number of iron or brass bobbins A mounted loosely on a steel shaft S. The bobbins loosely interlock with each other by means of projections B. A flexible rubber sleeve covers the whole of the bobbins and grips the roughened (often corrugated) surface of the bobbins. In the jig, shaft S is fixed stationary and the travelling fabric presses against the convex side K of the device thereby causing the whole of the sleeve and bobbins to rotate about shaft S. Because of the curvature of K this has the effect of spreading the fabric and removing creases. This type of expander is very efficient.

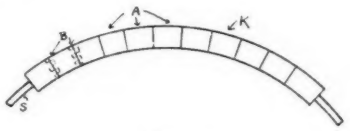

Figure 4

A typical spreading roller which can take the place of the expander bar described above is shown in Figs. 5a, 5b and 5c. It consists of a number of wood laths L mounted on a shaft S in such a manner that they can move laterally. Each lath has on its under side a small roller projection or "spider" which moves in the grooves V of A or B. These grooves are inclined to the axis of shaft S. The travelling fabric pressing against the roller causes its rotation and thus the lateral movement of the individual laths so that they alternate between positions as shown in Fig. 5b and Fig. 5c. This has the effect of spreading the fabric.

A disadvantage of the wooden spreading roller is that the wood persistently retains dyes and must therefore be very thoroughly cleaned between successive dyeings if the shades differ considerably.

So far the simplest method of using a jig has been considered in which the fabric is drawn from one draw-roller to the other; a necessary characteristic of this method is that the rate of travel of the fabric steadily increases during each end. It is possible to avoid this varying rate of travel by a comparatively simple method in which the fabric is "jacked."

In Fig. 6 is shown a jig fitted so as to allow of the jacking method. A and B are the usual draw-rollers and M and N, each on a steel shaft S, are additional rollers known as batching-rollers. These batching-rollers merely rest upon draw-rollers A and B, the ends of the shafts S fitting in the bearing slots T provided at each end of the draw-rollers. During rotation of A or B batch-rollers M and N are caused to rotate by frictional contact. By the jacking method the fabric is wound on the batching-rollers instead of the draw-rollers. It is evident that if draw-roller B is being driven then batch-roller N is caused to rotate and it thus winds fabric F from batch-roller M. The rate of travel of the fabric through the dye liquor is directly proportional to the surface speed of draw-roller B and since this speed is constant the rate of travel of the fabric is constant. Thus no matter the relative amounts of fabric on batch-rollers M and N the rate of travel of the fabric does not vary.

It may be considered that the jacking method would solve all difficulties of jig dyeing. It certainly has the advantage that creasing is less likely owing the mangling

action on the fabric while passing between the draw and batch-rollers. But unfortunately dyeing is very much slower by this method than when the jig is used in the ordinary manner. The reason for this is not far to seek. Dyeing occurs mainly while the fabric is on the roller and not while passing through the dye liquor; the time of passage through the liquor is much too short to allow much dyeing. While the fabric is on the roller it absorbs dye from the liquor which it has absorbed. Now when the jacking method is used the amount of dye liquor carried forward by the fabric is very much reduced owing

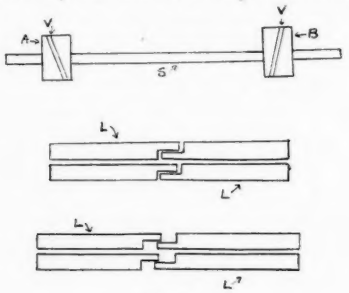

Figure 5

to the mangling effect; hence the reduced rate of dyeing. There is a further disadvantage of the jacking method in that the fabric is necessarily subjected to considerable pressure on the batch-rollers. With some types of fabrics, particularly those of a poplin weave, this pressure produces a kind of "moire" effect—a lustre effect also known as "watering." In viscose and cellulose acetate artificial silk fabrics this effect may become permanent and thus be objectionable.

Before turning to the construction of recent improved types of jigs it will be useful to consider the materials of construction of a jig. Formerly it was usual to make a jig with cast iron ends and wood sides or entirely of wood or cast iron. Both of these forms of construction have serious disadvantages. Wood readily contracts during drying and a wood jig must be maintained full of water to prevent the development of leaks during the time when it is not in use for dyeing. Also dyes are readily absorbed by wood. It is almost impossible thoroughly to cleanse a wood jig by washing, soaping, or even chemicking after dyeing with a black color. If a jig so used is afterwards used for dyeing a very pale shade this will become affected by the residual black dye which gradually dissolves out of the wood into the dye liquor. It is also difficult to dye pale shades in wood jigs so that exactly the same quantities of dyes are used successively for the same shade since these dyes become absorbed unequally by the wood of the jig. In fact, in tinting fabrics in a wood jig the wood absorbs more color than the fabric. But the greatest difficulty of cleaning a wood jig is experienced in the dyeing of cellulose acetate silk material. S. R. A. and similar dyes penetrate the wood and cannot be completely removed so that they tint the next batch of cellulose acetate silk fabric being dyed.

An iron jig is more easy to clean than a wood jig but nevertheless it has many serious faults under this head. In the first place iron is liable to rust so that iron stains become possible. Further, in acid treatment of fabrics in an iron jig the iron dissolves and affects the shade of the material being dyed. This is particularly noticeable in the mordanting of cotton goods with tannic acid or the dyeing of tannin mordanted goods with basic dyes. Iron derived from the jig forms with the tannic acid a blue iron tannate thus causing stains or dulling the basic color. At the present time China is demanding a Rhodamine shade of the utmost brightness. If this is produced on a tannic acid mordant in a iron jig it is almost impossible to obtain the required brightness owing to the small amount of blue color introduced. The remedy of course is to employ Katanol as a mordant since this does not react to form a colored lake with iron. Less satisfactory, but a remedy which has at times been found useful, is to add oxalic acid to the mordanting or dyeing liquor; this addition has the effect of rendering the dissolved iron inert.

It is thus obvious that it is much preferable to employ stainless or non-corrodable metals or other substances in jig construction. Probably the most satisfactory method is to line the jig, whether it be of wood or iron, with vulcanized rubber which is practically resistant to all the

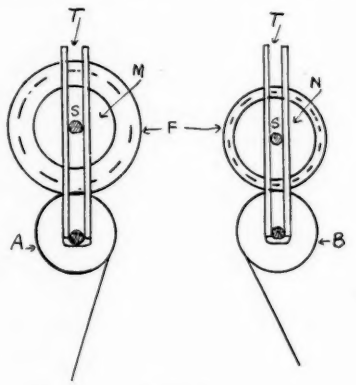

Figure 6

liquors, acid or alkaline, likely to be employed in a jig. Often the jig can be so lined *in situ* but generally a better job is possible when the jig can be sent away to be vulcanized in suitable plant at steam temperature.

The various rollers, both guiding and draw rollers, should be made of stainless material—an iron shell covered with vulcanite or other hardened rubber product is suitable. For many years earthenware draw-rollers have been used. They have given much satisfaction with cotton goods but with artificial silk, particularly cellulose acetate silk, fabrics they cannot be recommended. Their chief fault is that they retain heat for a prolonged period and in the dyeing of cellulose acetate silk fabric (whose rate of absorption of dye is largely dependent on temperature) the fabric immediately in contact with the hot roller dyes to a deeper shade. "Ending" is a characteristic fault in dyeing such fabrics on jigs fitted with earth-

enware draw-rollers. It may also be remarked that rollers of this type are heavy and thus tend to increase the tension on the fabric being dyed.

Attention must now be drawn to two new types of jigs which are specially designed for the dyeing of fabrics which should not be subjected to tension—artificial silk fabrics particularly. The first of these is the jig of Samuel Walker & Sons (Radcliffe, England). Its construction is shown in Fig. 7, all details being omitted. J is the jig itself and is of a narrow form in order to economize dye liquor; A is the one and only draw-roller provided. The fabric being dyed in passes backwards and forwards from roller B to C and then vice-versa. Rollers B and C are not positively driven but are carried in a quadrant and press against the draw roller A which is driven at constant speed; rollers B and C thus rotate by reason of their contact with rotating roller A. The guiding roller D situated in the bottom of the jig is positively driven from draw-roller A. In dyeing, the roller carrying the fabric is always placed vertically above draw-roller A so that the fabric passes between rollers C and A, around roller D, and is then wound on roller B. When all the fabric is wound on roller B a simple arrangement allows roller B to be placed vertically above A to take the place of roller C, and this latter is moved to the right-hand side of A in a position corresponding to roller B. When all the fabric is again wound on C the positions of the rollers are changed to the original ones shown in Fig. 7. It is clear that the fabric is propelled forwards by draw-roller A and this propulsion is at a constant rate. Moreover

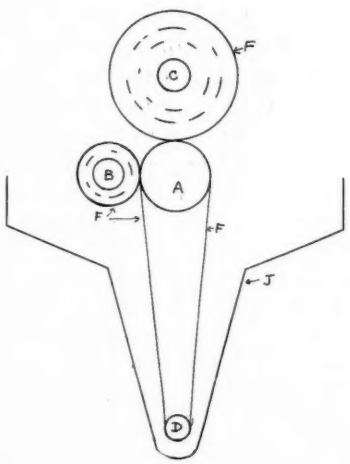

Figure 7

the fabric is not pulled from one roller to another but is merely propelled forward by reason of its contact with draw-roller A; it is unwound from roller C at exactly the same rate as it is wound on roller B. The fabric is thus not subject to tension. This dyeing machine is very simple to operate and has the advantage of being of comparatively simple construction. To a certain extent it involves the jacking principle described for use on ordinary jigs and must therefore suffer from the disadvantage of somewhat slower dyeing. Nevertheless, it has the great advantage of allowing fabric to be dyed under the least possible tension.

It may be added that the bearings of guiding roller D are of special construction such that this roller automatically adjusts itself parallel to the weft of the fabric.

The second type of jig specially designed for minimizing tension on the fabric being dyed is that made by Riley & Co., (Bury, England). It is really an improved type of ordinary jig as regards the body of the jig, but is otherwise entirely different. The jig contains two upper batching-rollers, two lower intermediate guiding-rollers and a bottom guiding-roller; the shafts of these rollers project through the end of the jig (with suitable stuffing boxes) into a separate compartment in which is housed all the driving mechanism. During dyeing the fabric is jacked as previously mentioned in this article so that it traverses through the dye liquor at a constant speed. The essential point of this jig is that *all* the rollers are positively driven and this is accomplished by means of an endless travelling belt. The drive to the batching-rollers is effected through ferrodo lined cones so that they may be reversed after each "end." It is evident that by means of this jig fabric can be dyed while maintained slack or under any desired degree of tension, since once this degree of tension or slackness has been fixed the fabric will be retained in this state. If dyeing is carried out in a very slack condition there is a tendency for the fabric to crease. Hence the jig is fitted with efficient expanders so that these creases are removed before the fabric is actually batched on either of the rollers.

All the essential features concerning the construction and performance of a dye jig have now been considered. It is seen that it is the one machine which most readily allows the treatment of fabrics in open width. This is its great advantage, particularly in connection with artificial silk materials which readily become permanently creased. On the other hand it tends to stretch such materials and this must be considered a disadvantage. In a succeeding article the winch machine by which fabric can be dyed in rope form will be examined in detail and it will then be possible to compare the uses and advantages of these two distinct types and indicate how the choice of the use of one or the other machine is related to the weaving construction of the fabric being dyed.

Dr. Chas. E. Mullin, Professor of Chemistry, Rayon and Dyeing in the Clemson College (S. C.) Textile School, recently addressed the students in the Charleston high schools upon the application of the subjects studied in high school to their future life work, and particularly to the textile industry. In connection with these talks Professor Mullin exhibited and described samples of many rare and unusual textile materials from all parts of the world.

Dyers' Accounts—II

Methods of Entering Transactions—The Control of Stock

By S. HOWARD WITHEY, F.C.I.

THE dyer's cash book will be nothing more than a cash account bound separately in book form for the sake of convenience in handling, the various amounts of cash received being recorded on the left-hand or debit side, and the payments enumerated on the right-hand or credit side. There is no standard form of cash book applicable to dyeworks practice, and as a matter of fact, the rulings will vary in individual cases according to the class of trade and the particular method already set up by the dyer for handling and dealing with the remittances received from customers. For example, if the dyer makes a practice of keeping back some of the cash received in order to defray urgent management or working expenses, or for the purpose of meeting the pressing claims of local creditors, the cash book should be provided with three money columns on each side, headed "Discount," "Cash," and "Bank," respectively, whereas when a fixed rule is made to pay to bank all cash received, without exception, it will not be necessary to have a "cash" column on the credit side of the cash book because all payments made by the dyer will have to be in the form of checks drawn on the banking account to be recorded in the "bank."

Dealing with Discount

Whether in the form of checks, bills, drafts, notes, postal orders, or coin, all amounts of cash received should be entered in the "cash" column on the debit side of the cash book, each item giving the date and the name of the sender. Remittances from customers in whose names ledger accounts have been opened by the dyer should be posted direct to the credit side of their respective personal accounts opened in the sales or customers' ledger with the date of payment, the word "By Cash," or "By Check," and the cash book folio, in each case. If the customer has been allowed a discount in respect of payment within a stipulated or a recognized period, and has deducted the correct amount at the time of remitting, the discount should be recorded in the "discount" column on the debit side of the cash book, on the same line as the specific cash item to which it has reference. When crediting the cash to the personal account, the discount should also be credited either as a separate entry reading "By Discount," or added to the cash and shown as "By Cash and Discount," or "By Check and Discount." After making the necessary entries in the ledger, the page on which the account has been opened should be inserted in the "ledger folio" column against the cash book entry, and upon no consideration should a ledger folio be set down against a cash transaction until the amount has been actually posted.

Payments made in legal tender money must be recorded in the "cash" column on the credit side of the cash book with the date of payment and the name of the personal or other account to be debited. Cash forwarded to creditors and trade suppliers will have to be posted direct to the debit side of the particular personal accounts opened in the dyer's purchases or bought ledger, each ledger entry giving the date, the words "To Cash," and the cash book folio. Items representing discounts obtained by the dyer for the prompt settlement of creditors' accounts should be shown in the "discount" column on the credit side, each amount being entered on the same line as the item of cash to which it relates. The amount of each check drawn by the dyer must be inserted in the credit bank column.

Bank Reconciliation

It is a good practice to reconcile the bank balance as shown in the cash book at the end of the month, with the figure shown in the dyer's bank pass book. To do this, all items entered in the "bank" column on the debit side of the cash book—representing cash paid to bank—should be carefully compared and ticked off with the corresponding items as set down on the deposits side of the pass book, and all items in the "bank" column on the credit side of the cash book—representing cash withdrawn from the bank—compared and ticked off with the amounts recorded on the withdrawals side. If any checks drawn by the dyer during the month have not been actually presented at the bank for payment by the particular payees, it will be necessary to make out a list of all such unpresented checks in order to be able to reconcile the bank balance. The following is a specimen bank reconciliation as drawn up at November 30, 1929:

Bank Reconciliation — November 30, 1929

	£	s.	d.	£	s.	d.
Credit balance as per pass book at November 30...				659	10	6
Less unpresented checks, viz.: X Dyestuff Co., Ltd.	15	9	6			
Jones Brothers, Ltd.....	11	10	0			
Smith & Brown, Ltd.....	14	9	2			

Manchester Engineering Co., Ltd.	75	0	0			
B. Robinson, Ltd.....	25	6	8			
Nathaniel Green, Ltd.	9	5	0			
				151	0	4
				508	10	2
Add amount paid to bank on November 30 but not credited by bank until December 2				85	14	9
Debit balance as per Cash Book at November 30..				594	4	11

Balancing Accounts

In a case where the dyer is carrying on business with the aid of a bank overdraft, the total of the unpresented checks would have to be added to the debit balance as shown in the pass book.

As soon as all amounts representing cash paid by customers and discounts allowed by the dyer have been posted to the ledger, the personal accounts can be balanced and ruled off. To prevent the constant adding of the same figures, this balancing should be undertaken at the close of each month's work when a list of all outstanding debts can be very conveniently made out by tabulating all the ledger balances. To balance any particular sales ledger account, the total of the debit items should be inserted in pencil directly underneath the last debit entry, and the total of the credits set down underneath the last credit item, and if the debit total is the higher figure, the difference should be inserted on the credit side of the account, together with the date, viz.:—The last day of the particular month and the words "By Balance carried down." The two totals of the account will then correspond with each other, and when this has been verified the totals may be ruled off opposite each other on the same line, and the balance brought down on the debit side as the opening entry for the next month, reading "To Balance brought down." In some instances, owing to overpayment on the part of customers or by reason of an insufficient discount deduction, the total of the credit entries will be greater than the total of the debit entries.

When balancing such an account the difference will have to be inserted as the last entry on the debit side, with the balancing date and the words "To Balance carried down," enabling the two totals to be ruled off and the balance brought down as the opening entry on the credit side, showing the date and the words "By Balance brought down." The abbreviations "c/d" and "b/d" may be used to denote "carried down" and "brought down," respectively. As soon as the two totals of an account are seen to exactly correspond with each other, they should be ruled off at once to show no balance outstanding.

The next instalment of this series will show the best method of controlling and recording the inward movement of dyestuffs, materials, and stores, etc.

The large amount of capital in existence in the form of stores—coloring agents, acids, extracts, etc.—calls for the adoption of methods calculated to enable the dyer to control the stock from the time it arrives on the premises to the time the finished materials have been despatched to the customer. In the every-day conduct of a dyeworks this control or internal check is a matter of very considerable importance and must always be borne in mind and provided for in the bookkeeping arrangements, for upon no consideration should the stock under any basic heading be allowed to dwindle below the minimum which experience or local conditions prove to be necessary. Unless the requirements of customers are satisfied immediately valuable business will be lost.

As soon as the stock of a particular compound threatens to reach the minimum determined by the dyer or departmental head, it is a good practice to make a note of the fact, not on a pad or even in a private diary, but in a special book kept for the purpose. This book—called the stock order book—should be provided with columns or divided into sections for the insertion of the date; the name of the person or the department requiring the stock; particulars of the dyes, assistants, finishing mediums, etc., required, including the quantity; and the name of the person authorizing the order, while an ample margin should be left for any remarks or observations relative to the entry.

Keeping Track of Stock

This ruling should appear on the left-hand side of each opening of the book, the right-hand pages being reserved as a section for office use, this comprising columns for the insertion of the date on which each order was placed by the dyer; details of materials actually ordered; each distinct order number; the date on which the stock came to hand; and an indication of the general condition upon arrival. If a stock book is kept, a column should be provided in the order book for showing the page or folio on which the necessary entry has been made in the stock book, or for a reference to the entry made in the inwards book kept in the receiving department. This office section will be found particularly useful when references have to be made, either by the dyer or any of the staff.

After an order has been properly sanctioned, the official order form should be made out and forwarded to the suppliers, and for this purpose a duplicate book containing thin tissue leaves should be kept on carbon-copy principle, the original sheet being removed in every instance and the carbon copy retained for

purposes of future reference. If an additional copy of each order is required for transfer to the office for use, when verifying the accuracy of the details enumerated on the various invoices when they come to hand, a manifold order book should be kept.

Works Purchases

The stocks are most effectively and systematically controlled by recording all works purchases on the left-hand or received side of a stock book, separate columns being provided for the insertion of the date received, the order number, the name and address of the suppliers, particulars and the quantity the price or rate, and the monetary cost. All issues made from stock should then be recorded on the right-hand side of the stock book which may be ruled in the same manner as the left-hand side, the different columns being used for showing the date of each issue; the requisition number; the name of the person or the department to whom issued, particulars and the quantity, the price or rate, and the invoiced cost. The dyer should insist upon the production of a delivery or advice note giving details of dyes, materials, and stores, etc., received, including the order number, and before transferring the stock to its allotted place, both the quantity and the quality should be carefully compared with the copy or copies retained in the dyer's stock order book. When fluids are weighed out in small quantities from the bulk it may be advisable to add a small percentage—such as 2½ per cent—to the quantities recorded on the right-hand side of the stock book, to cover spillage, etc.

The invoices received from suppliers should be checked and then numbered in consecutive order, after which they may be stamped with a rubber or other suitable impression. If the business is a small one, the number of operations to be covered by the stamp will be few, but in the case of a large business with several departments the operations should be suitably allocated and shown in the manner indicated below:

(INVOICE STAMP)

No..... Date.....19....
Dyes, Materials, etc., Received by.....
Quantity & condition. Checked by.....
Price & discount. Verified by.....
Calculations, additions, etc.....
Approved by.....
Passed for payment by.....
Stock Book Folio.....
Purchase Journal Folio.....

No invoice should be passed for payment, or even approved, until all the details have been verified and signed for and the folio of the Stock Book set down in the space provided by the stamp.

It sometimes happens that dyestuffs taken into stock are subsequently found to be unsuitable. In the majority of cases, these dyes will be returned and it is just as necessary to record the return of stock as it is to book the receipt of stock. All dyes and materials returned should be entered in a special outwards book showing the date; the name of the suppliers; the original order number; particulars and the quantity returned; causes of rejection; the rate or price; and the invoiced cost. This book could also be used for recording details of all empties returned

Materials on Hand

The great advantage of keeping stock books as a part of the general bookkeeping system is that the quantities of dyes, materials, acids, etc., on hand at any time can be readily ascertained by adding up the quantities recorded on the left-hand side of the stock book, and deducting from this total the quantities issued from stock as shown on the right-hand side and the quantities returned as shown in the outwards book. This means that the dyer will be able to ascertain the amount of gross profit he is making, and will not be compelled to wait until the close of the financial year before he can view the operations and trend of the business in their true perspective. If the quantity and also the value of the stock on hand under each heading is desired, a stock ledger should be kept, and in the next instalment of this series the method of keeping and balancing these stock ledger accounts will be indicated, as also will the correct method of classifying the different kinds of purchases and returns outwards for ledger posting purposes.

—The Dyer and Calico Printer.

1930 SUMMER CARD

THE 1930 Summer Color Card is now being released to the trade by Managing Director Margaret Hayden Rorke of the Textile Color Card Association.

Fourteen shades of high style importance for the coming summer season are portrayed on the new card, pinks and blues constituting the dominant color families. The color theme used for the cover of the card is likewise carried out in various gradations of pink and blue. Soft pastel tones predominate.

The yellow range is represented by Sungold, a clear light tone. Tulipe Rouge, reflecting a bluish undertone, is the rich shade of red tulips. A high style note is introduced in Pastel Grey, having a delicate pinkish tint. Antique White is a new interpretation of a creamy off-white nuance.

For purposes of correct color coordination between the costume and accessories, the colors on the 1930 summer card have been keyed to the Color Correlation Chart recently issued by the Association.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
E. H. KILLHEFFER
Newport Chemical Works, Passaic, N. J.

Vice-Presidents
WALTER S. WILLIAMS—P. J. WOOD

Treasurer
HARRY R. DAVIES

Secretary
ALEX MORRISON
American Woolen Co., Andover, Mass.

Councilors
RALPH F. CULVER — GEORGE A. MORAN
B. F. PHETTEPLACE — HUGH CHRISTISON
WILLIAM R. MOORHOUSE — WALTER M. SCOTT

Past President and Chairman of the Research Committee
LOUIS A. OLNEY
Lowell Textile Institute, Lowell, Mass.

LOCAL SECTIONS AND THEIR OFFICERS

Northern New England Section—
William H. Cady, Chairman, 127 Power Street, Providence, R. I.
Harold C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Rhode Island Section—
Richard B. Earle, Chairman, 133 Power St., Providence, R. I.
A. Newton Graves, Secretary, Franklin Process Co., Providence, R. I.

New York Section—
P. F. Kingsbury, Chairman, Passaic Print Works, Passaic, N. J.
W. H. Wingate, Secretary, 318 Bogert Avenue, Ridgewood, N. J.

Philadelphia Section—
A. M. Burt, Chairman, 1046 Public Ledger Building, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
R. M. Mitchell, Chairman, 808 Cypress Street, Greensboro, N. C.
Arthur R. Thompson, Jr., Secretary, 1109 Independence Building, Charlotte, N. C.

South-Central Section—
R. S. Wheeler, Chairman, Crystal Springs Bleachery, Chickamauga, Georgia.
Lee Roy Hiller, Secretary, Crystal Springs Bleachery, Chickamauga, Ga.

Midwest Section—
Carl E. Bick, Chairman, Real Silk Hosiery Mills, Indianapolis, Ind.
William Bergh, Jr., Secretary, Vassar Swiss Underwear Co., Chicago, Ill.

Lowell Textile Junior Section—
Earle R. McLean, Chairman; Alfred J. Carbone, Secretary.

QUARTERLY MEETING OF MID-WEST SECTION

MEETING called to order at Bismarck Hotel, Chicago, Illinois, February 15, 1930, Carl E. Bick, of the Real Silk Hosiery Mills, Indianapolis, Ind., presiding.

After the Secretary, Clarence Wille, and the Treasurer, J. W. Kopf had read their reports, the following officers were elected for the year 1930:

Carl E. Bick, of the Real Silk Hosiery Mills, Indianapolis, Ind., re-elected chairman of the Mid-West Section.

Max A. R. Selisch, of the Thread Mills Co., Monticello, Ind., vice-chairman.

Wm. Bergh, Jr., of Vassar Swiss Underwear Co., Chicago, Ill., secretary.

Stephen A. Berry, of the Olson Rug Co., Chicago, Ill., treasurer.

Arthur T. Brainard, of the Ciba Co., Chicago, Ill., member of the National Nominating Committee.

Mr. Bick, the chairman, thanked the group for their co-operation during the year. Mr. Kopf was asked to appoint four members for the membership committee. Membership Committee appointed as follows:

Chairman, Elmer Scharf, Holeproof Hosiery Co., Milwaukee, Wis.

F. H. Proudfoot, Nyanza Color & Chemical Co., Chicago, Ill.

Eric F. Hempel, National Knitting Co., Milwaukee, Wis.

Nestor Grotelueschen, Holeproof Hosiery Co., Milwaukee, Wis.

A rising vote of thanks was then given to the old officers and also Mrs. Clarence Wille for the assistance she gave her husband in performing his duties as secretary. James A. Branegan, President, Kali Manufacturing Co., Philadelphia, Pa., then gave an interesting address on "The Development of the Textile Chemist and New Developments in Textile Chemicals." The speaker was given a rising vote of thanks and requested to speak again at one of the meetings in the near future.

Respectfully submitted,
WM. BERGH, JR., *Secretary.*

The Development of the Textile Chemist and New Developments in Textile Chemicals

By JAMES A. BRANEGAN
President, Kali Manufacturing Company

IN making an address to Textile Chemists and Colorists one is expected to talk Chemistry. Chemistry, however, is sometimes misunderstood. In the East, we chemists

tell a story of the Chicago gunman who would not send his boy to college until he learned that a certain college taught trigonometry, and he immediately sent his youngest son to that college because he was the poorest shot in the family. And, again several years ago, I was sitting in our booth at the Chemical Show in New York when a young lady came up and asked me if I was a chemist. She said she was anxious to meet a real chemist as she was somewhat of a chemist herself—she developed her own films.

When my friend, Mr. Morgan, requested me to come West and give you a little talk, I was somewhat puzzled as to what would be the subject of this talk. I wrote Mr. Morgan that I would make the subject of my talk "The Development of the Textile Chemist and New Developments in Textile Chemicals." However, before talking about the textile chemist, I believe another subject should precede it, and this subject should have the following title: "The Dyer Always Gets the Blame." To me, after years of experience as an itinerant chemist wandering all over this broad land, it appers that the subject of the textile chemist should always be preceded by the remark—"The Dyer Always Gets the Blame."

For a number of years, before I entered the service of our Government in the World War, I was trouble chemist for one of the largest chemical houses in the world and, naturally, most of the complaints we had came from textile people as our business was largely among the textile trade. Now when I was called upon to investigate any trouble in a textile mill I was, of course, properly introduced and usually I was ushered into the president's office and no matter what the trouble looked like, the boss' first remark to me was invariably: "Our dyer is having trouble." It appears that no matter what the sheep raiser in the West fed to his sheep—or the Japanese fed to their silk worms—or the Southern cotton man put on his land—or the various chemicals used by the rayon manufacturers did to the various products mentioned—the dyer was to blame if the final product was not O.K. The weaver or knitter could saturate his yarns with tar, molasses, or asphalt and the dyer was expected to get it off. The wool spinner could saturate his wool with candle grease, or antique fish oil—the dyer was supposed to fix it up. Iron spots, mildew, hardening of the arteries and other things that might happen to the textiles meant nothing—the dyer was expected to make it good. Therefore, it is not amiss to say that the textile chemist and colorist to-day must be sort of a magician who can turn everything around so that it looks O.K. when it is finished —no matter what happened to it all along the line.

The textile chemist and colorist should not only be a high grade dyer, but he should know how to test, not only the various products used in the dye-houses, such as textile soaps and oils and dyes, but also lubricating oils, coal, water, and even the air itself. He should be conversant with the chemistry of textiles, including the ground in which the cotton is grown, the diseases of the silk worm, and the climates of the countries where live the sheep from which the wool was clipped. For most assuredly, no matter what trouble occurs along the line, he will probably get the blame.

It is only within recent years that a man with any technical knowledge at all was considered a necessity around the dye-house. In former days the chemist was considered sort of a nuisance and trouble-maker, but in those days a certain amount of seconds and waste was considered as a matter of course. While to-day the profits are estimated by the amount of seconds and waste we do not have.

The development of the textile chemist has been slow but sure—as the following instance will show:

When I was a young man, the tin weighting of silk was in its infancy, having developed from the fact that in dyeing with certain bark extracts and tin crystals considerable weight was obtained. Later it was found that phosphate of soda and bichloride of tin gave a still greater weight. The house where I was employed as chemist made the bichloride of tin and we made it by the crude but very simple process of granulating the tin by melting and pouring into cold water. This granulated tin we dissolved in muriatic acid, and this we oxidized with nitric acid to bichloride of tin. At the chemical works we made very little effort to test it, but simply sent it out as we got it, providing the hydrometers showed 50° Beaumé—if it did not show this strength, and it usually fell a few degrees short, we added some common salt to make up the difference. After a while the dyers commenced to tell us that some lots of bichloride of tin worked better than others, and we started to make analytical tests. We found at the chemical works that the lots of bichloride of tin which contained a certain slight excess of muriatic acid gave the best results, and results that became more positive to the dyer. Almost immediately after these tests developed the tin weighting industry increased.

The dyer, however, did not know why he was getting better results and as the silk takes the tin and muriatic disproportionately, he still had trouble with his tin bath—although not as much as formerly when we gave him indiscriminate amounts of free acid. However, the price of tin was very low in those days and when trouble did develop he pulled the plug and started fresh. In a few years, this "pulling the plug" became expensive and the dyer with a little technical training learned to test his bath for free muriatic, or send it at stated periods to a chemist for testing. When he found himself short, he figured the correct amount to add and there was no more "plug pulling." To-day in every dye-house where tin

weighting is done, the baths are tested at regular intervals and corrections made—plus or minus—as it is shown that the muriatic acid content needs must be increased or decreased, and this is where the textile chemist becomes very important. Furthermore, the making up of the bath itself is more complicated as nowadays 100% bichloride of tin, correctly called tetra chloride of tin, is used. This is a dangerous fuming liquid and best handled by a man with some chemical training.

Nor is this testing of the bath the last word for the textile chemists. At first the buyers of tin-weighted silk did not know of artificial weighting, but it was part of the development of the industry for them to find out—and they most assuredly did find out. Then came the period when they expressed a preference for silks of certain weights. Up to a few months ago there were no rapid methods applicable to the ordinary silk mill for determining the amount of tin weighting on silk, and the writer was retained by several large silk industries to develop a method for this rapid determination, which would be satisfactory to both the dyer and the purchaser of weighted silks. This has been accomplished and now methods of determining and calculating the tin weighting on silk are now in such form that the textile chemist can easily run through the analyses without going through an extensive technical research which heretofore was considered necessary.

From this you can see the development of the textile chemist from the beginning when even the manufacturer of textile chemicals did not bother much about testing. Later, as I have shown, the dyer started testing his tin baths and now the consumer is testing his silk to check up with the dyer as to how much tin is put on the silk. This is the result of textile chemistry and has worked out beneficially to both the dyer and the consumer.

The same thing holds good, whether it is soap or textile oils. The matter of water is of vast importance to the textile worker, and here again the textile chemist has proven his worth.

Dyes are usually expensive and the textile colorist, with his knowledge, can easily find out which is the most economical and which is the most adaptable for the results desired, and he can do all this in the laboratory before running the big lot and before it is too late.

Regarding the dyes themselves, I notice an increase in the use of Indanthrine colors and a corresponding decrease in the price. This is a class of dyeing which certainly makes it necessary for the textile chemist and colorist to have some technical knowledge.

While the textile chemist has been developing, textile chemistry itself has been making rapid strides. One of the latest developments in textile chemistry, and perhaps one of the most startling that has developed within the last few years, is the immunization and aminization of cotton. Although it was known for a great many years that cotton treated with certain compounds of toluol would resist or be immune to direct colors, it was not until recently that some Swiss chemist started to develop the process in a practical manner. The salt used is a by-product from the manufacture of saccharine and its proper name is paratoluol sulphochloride. In Germany, and in Europe in general, the use of saccharine is largely permissible and, therefore, large quantities of this by-product is produced, the saccharine itself being simply the autho-compound of the same salt. In this country its production as a by-product is very limited on account of limitations placed on the use of saccharine.

The crude paratoluol sulphochloride is purified, which is quite an expensive process and all the patents regarding its use are held by a Swiss concern, I believe. The cotton to be immunized is first treated with a caustic alkali and then treated with the paratoluol sulphochloride dissolved in a solvent like toluol or carbon tetra chloride. A reaction takes place and when dried the cotton has changed chemically and is immunized. It can be immunized in the natural state or it can be immunized after dyeing, but the dye used must be one which has been proven will resist the immunization process itself. After the cotton is immunized it will, as the name implies, be immune or resist direct colors.

The immunization of cotton is very adaptable after mercerizing as here we have the cotton already treated with caustic soda. However, the immunization process leaves the cotton somewhat harsh and in our laboratories at Philadelphia we have developed an emulsion paste which softens the mercerized immunized yarn so that the knitting will run smoothly. The cost of the immunization is high just at present but the fact that it resists direct colors makes its use very advantageous, particularly in the manufacture of novelties.

If the immunized yarn is later treated with ammonia, it is converted into an amine which is one of the constituents of wool and silk. This aminized yarn will dye exactly like wool or silk. In other words, it will dye in a solution of one to four per cent of sulphuric, acetic, formic, or any other acid—plus the usual amounts of Glauber's salt. Here again we have a decided advantage when wool or silk are mixed with cotton and it is desired to dye with acid colors.

Another late development is the hydroxy acid-proof oils, or like products. Here we have a soluble oil of the hydroxyricinoleic series which will stand acid in the bath. As you know, when you add acid to a soluble oil or a soap, the oil is apt to break and fatty acids come to the surface and get on the goods. Lately, however, in the development of products along the lines of hydroxy acid-proof compounds, the dyer can get oils which he can add direct to a bath containing formic, acetic, sulphuric or other

acids. This is a decided advance, particularly in the dyeing of silk and wool where acid baths are used, and where it is desired to keep the goods soft with soluble oil. Also, it can be used with advantage to after-baths containing the various acids.

For the hosiery industry, boil-off oils are produced which do not form lime soap with hard water and, therefore, reduce the possibility of the formation of dough-balls on stockings. These new boil-off oils are more economical than soaps and some of them are so blended as to remove mineral or other oils with which the hosiery yarns may have been treated. These boil-off oils are made up so that the dyer can boil-off and dye in the same bath, therefore, reducing the friction on the hosiery. Even when the stocking contains only mineral oil from the coning and winding, a boil-off oil can be obtained which will remove them. Mineral oils are frequently condemned, but if applied and properly blended, and the proper boil-off compounds are used, they give excellent results.

Speaking of oils used for coning and winding of hosiery yarns reminds me that there are now rayon emulsion oils on the market. After these rayon emulsion oils are applied, the cones can stand for any length of time and after knitting it into hosiery, the oils are easily removed by washing in cold water. In other words, they emulsify themselves instantly. These oils are also made of a heavy viscosity for underwear knitting.

Rayon boil-off oils are now so constructed as to hold the oils in suspension in the boil-off bath with no danger of their coming to the top.

The older processes of soaking silk—previous to throwing—include two principal methods. One was by using soap and free oil, the soap being added to emulsify the oil. The other method is with derivatives of mineral oil. Mineral oil when used for soaking silk gives excellent results if properly treated with other elements which permit of its easy emulsification in the boil-off. Some manufacturers prefer the mineral oils but in the past they have been more or less avoided because of difficulty in removing. Now, however, we have ideal throwing oils, or like products, which contain mineral oil but which emulsify readily and are easily removed. The throwster can now use mineral oils so prepared without fear of a comeback from the dyer and at the same time have the high lubricating power characteristic of mineral oils. These oils are made to give any clearance desired.

Very recently there have been developed oils containing nothing but olive or neatsfoot oils chemically treated which make a perfect emulsion in water. Also, they perfectly lubricate the silk for winding and instead of retarding the dyer they assist him, as it is known a certain amount of soluble oil always assist, the dyeing process.

In the woolen industry, woolspinols, or like products for spinning wool, are produced which make perfect emulsions without the aid of rosin soaps. Therefore, the trouble of gumming-up is permanently eliminated.

Hydroxy oils and similar oils of the sulphonated castor series are now made so perfectly and the sulphonation controlled so accurately that all guesswork is eliminated and hydroxy oils or similar products are now produced which, due to laboratory control, are always the same—whether made a year ago to-day or a year from now.

Chemical plants manufacturing textile chemicals have research laboratories which are devoting all their time to scientific sizing of rayon. This is a very important matter, the scientific sizing of rayon. This is a very important matter, particularly the sizing and slashing of the acetate rayons and, although there is some work to be done along these lines, some of our laboratories have progressed to the point where the height of perfection is practically reached.

The textile chemist should be familiar with simple tests for all the elements and acids. I am so much interested in this subject that I have just completed a book in which I have written "Simple Tests for Dyers and Industrial Workers" and this book will contain not only simple tests of all the metals, acids, and compounds, but also simple tests for the various materials used around industrial plants, such as cement, lubricating oils, paper, etc. This book I have written with no view for making money as it is my intention to send it to various young men in the textile industry who I feel need some assistance of a technical nature.

The textile chemist should spend at least some time on research or developing new combinations or new ideas and the simple tests he learns should be used in control of his regular work. He should be of an inquiring mind and endeavor to learn "Why he does certain things"—such as adding formaldehyde after direct dyeing. There are new tests always developing, such as the potential hydrogen tests—or pH tests as they are commonly called. This is valuable for showing the amount of acidity in dye baths or bark extracts which otherwise could not be indicated by the common reagents.

The future of the textile chemist lies in the fact that he cannot limit himself to the dye-house but must have a knowledge of control tests for every part of the plant. As the blame of good or bad qualities of the finished product are placed upon the shoulders of the dyer, the textile chemist and colorist must insist upon knowing what is going on all along the line and in this way with the control tests mentioned above he will be able to check trouble before it reaches the dye-house, and he will reach that point of perfection where there will be no more explanations to be made.

QUARTERLY MEETING OF THE SOUTH CENTRAL SECTION

THE Quarterly Meeting of the South Central Section of the American Association of Textile Chemists and Colorists was held Saturday evening, February 15, 1930, at the Hotel Patten, Chattanooga, Tennessee, with an attendance of about forty.

The following officers were elected for the ensuing year:

Chairman: R. S. Wheeler, Crystal Springs Bleachery, Chickamauga, Ga.

Secretary: L. R. Hiller, Crystal Springs Bleachery, Chickamauga, Ga.

Treasurer: H. A. Rodgers, National Aniline Co., Chattanooga, Tenn.

The Chair appointed the following arrangement committee for the year:

Wm. J. Kelley, Jr., c/o Burkart-Schier Chemical Company, Chattanooga, Tenn.

Robert D. Sloan, c/o National Yarn & Processing Company, Chattanooga, Tenn.

Homer Whelchel, 308 Benton Ave., Chattanooga, Tenn.

The meeting was favored with a most interesting and comprehensive paper on "The Application of Sulphur Dyes" by E. P. Davidson of the E. I. DuPont Company.

We were pleased to announce the transfer of J. Remington from the West to the South Central Section.

Respectfully submitted,

L. R. HILLER, *Secretary.*

Notes on Sulfur Color Dyeing

By E. T. DAVIDSON

E. I. Du Pont De Nemours & Company

WHEN the sulfur colors were first introduced they were considered rather difficult to dye, since all synthetic dyestuffs up to that time had been water soluble, requiring only to be dissolved in water before proceeding with the dyeing. Consequently, the dyeing of sulfur colors attended by the necessity of dissolving in sodium sulfide and soda ash exhausting the bath with salt and finally oxidizing and washing, presented a procedure which seemed rather complicated to the dyers of that time. However, the dyestuffs were rapidly improved especially in solubility, becoming much easier to handle. As the dyeing procedure became more familiar, and the excellent fastness qualities of the dyestuffs recognized, their use spread rapidly until at the present time they are used in as large a quantity, at least, as are the dyestuffs of the substantive class. In fact, we have become so familiar with them, that we are inclined to think them so simple that they can be dyed with very little trouble by almost anyone and in almost any way, and that there is little left to learn about them as far as the usual methods of application are concerned.

On the contrary, there is no class of dyestuffs in general use of which we know so little, and to-night it shall be my endeavor, through the enumeration of a few points in connection with these colors, to stimulate a greater interest in the problems of their application.

To begin with, even the exact composition of most sulfur dyestuffs is unknown. We know which intermediates will produce a given dyestuff, we know how to combine the intermediates, but we do not know exactly what we have when we get through. Most sulfur dyestuffs as they come from the plant, are mixtures of various chemical compounds which we are unable to disentangle in our present state of knowledge, and of whose exact nature we are ignorant. That is, they are not pure chemical compounds, as are the other classes of dyestuffs in general.

We do not know what takes place when the color goes into solution in the presence of sodium sulfide, or whether what we call oxidation in connection with these dyestuffs is a true oxidation, or whether some other factor comes into play in addition. We are not certain of the causes of tendering, of what takes place in the various after-treatments used in connection with these dyestuffs, or of the reasons for shade changes after finishing.

Taking all this into consideration, it is not much to say that, while the sulfur colors are probably not the most difficult class of dyestuff to handle, they at least require close, careful and intelligent supervision in the dyebath to obtain the best possible results.

Let us consider briefly some of the most important points in the dyeing of these colors. You are all familiar with the chemicals used in dyeing them. The sodium sulfide is the solvent for the dyestuff, the soda ash maintains the alkalinity of the dyebath, and the salt is used primarly as an exhausting agent. The dyeing temperature is a very important factor, also the method of oxidation and the wash after dyeing.

As you all know, there is a wide variation in the solubility of the various sulfur dyestuffs. The sulfur greens and bordeaux are usually the easiest, and the yellows and some of the browns the most difficult, to dissolve. The yellows as a rule dissolve best with about twice as much sodium sulfide as color, and should be given a preliminary boil in a very concentrated sulfide solution. In this connection we may say that the dissolving action of the sulfide is proportional to the concentration of the solution; that is, a proportion of sulfide to color of three to one in 200 gallons of water would not have nearly as much effect as a proportion of one to one in 50 gallons. Some of the greens on the other hand may be dissolved with as little as one-fourth as much sulfide as color, at about 180 to 190° F. and give their best strength with this procedure, although the washing fast-

ness is apt to be affected injuriously. However, one-half as much sulfide as color is usually sufficient for the greens, and they dissolve best in a larger volume of water than do the yellows. As nearly all green shades are produced with a mixture of green and yellow, in varying proportions, this brings up the question of how much sulfide to use in these combinations. If the amount of sulfide is adjusted to suit the yellow, the green is held in such thorough solution that it can be only partially salted on. If the sulfide is adjusted to the green, the yellow is not dissolved, and in either case a goodly portion of the dyestuff weighed out remains in the dyebath and goes down the drain when the drain-valve is opened. The use of the sulfur bordeaux in shading browns is similar.

Where such wide differences exist in solubility, it is not possible to obtain the full value of both dyestuffs when they are dissolved in the same barrel. It is much better to dissolve them separately with their proper quotas of sulfide, and then mix them in the dye bath. This is a little extra trouble, but it will pay for itself in saved dyestuff and more level and better penetrated dyeings. There is another method in use at present in several mills to obtain the same result, though whether it is practical or not depends entirely upon local conditions; that is, in cases involving wide differences in solubility, to dye one of the components first, drain the bath, and then dye the other. This method gives highly satisfactory results in so far as levelness, penetration and economy of dyestuff are concerned, but of course requires about double the dyeing time; and it is always necessary to dye the more insoluble component first, since the soluble component, if dyed first, would be stripped badly in the second bath.

The sulfur blues will also well repay some experimenting on the proportion of sulfide. If too much of this chemical is used, the dyeing will be weak; if too little, there will be a tendency toward streakiness and bronziness. The latter result may also be due to improper oxidation or defective machinery, and will be discussed at more length later.

Most of the sulfur browns require a large amount of sodium sulfide, and will not yield their full strength unless boiled thoroughly in a concentrated solution before diluting to the volume of the dyebath.

Sulfur blacks should be carefully watched, as they come in many concentrations and the proper proportion of sodium sulfide to dyestuff varies with the concentration. Part of the color value can easily be lost if either too much or too little sulfide is used.

Soda ash is always used in the dyebath except when caustic soda is substituted for special purposes, but we are not concerned with this aspect of the problem to-night. Soda ash is intended, as was said a few minutes ago, to keep the bath in an alkaline condition. At the temperatures used in the dyebath, both the sodium sulfide and the dyestuff itself have a tendency to decompose, especially in the presence of oxygen, and to release free acid. Soda ash, by maintaining the alkalinity, retards this reaction considerably; it also precipitates lime salts to some extent when they are present in the water, and so provides a softer water for dyeing. Ordinarily, the use of one-half as much soda ash as sulfide is recommended. This is a relic of the early days of sulfur colors. The first sulfur colors that appeared decomposed so easily that it was customary and necessary, in order to check this decomposition as much as possible, to mix the soda ash with the dry dyestuff before adding the sodium sulfide and water for dissolving. At that time, a fairly large amount of soda ash was necessary, but the sulfur colors of to-day are very much more stable and smaller amounts may be used with safety. In fact, in the laboratory, dyeings made without soda ash in the bath apparently give about as good results as those made with this substance present. This probably does not hold true in the plant, but recent work along this line leads us to believe that the use of one-fourth as much soda ash as sulfide is probably the maximum necessary. The amount to be used, however, will depend to some extent on local conditions, such as the type of machinery used, water supply, etc. It should be borne in mind that any large excess of soda ash has a tendency to hold the color off the fiber, and should therefore be avoided.

The salt is of course intended to drive the dyestuff on to the fiber, and the amount necessary varies with the depth of the shade. In the case of the sulfur blacks, the amount is best adjusted with a hydrometer. A sulfur black standing bath should ordinarily show about 3½ to 4 degrees Tw. at 200° F.

The question of dyeing temperatures is one of great importance. A great many, perhaps the majority, of dyehouses, are inclined to dye all sulfur colors at a uniform temperature of about 180 to 200° F. While this simplifies procedure in the dyehouse, it is not by any means the most economical way of dyeing. The majority of sulfur colors will dye at this temperature and give their best results, but quite a few will do much better with a little different management. When dyeing a self shade or a combination of dyestuffs of the same temperature group, it is easy to approximate proper conditions, but where one of the low temperature group is dyed in combination with one of the high temperature group, as is sometimes necessary, it is quite a problem to balance the dyeing temperature properly. For instance, practically all of the sulfur blues give much stronger, clearer and brighter results when they are started at the boil and dyed in a cooling bath for 1 hour. The bordeaux as a rule dye best at a temperature of 140° F. all through the

dyeing period. The greens, like the blues, dye best in the cooling bath, starting at the boil. This procedure is possible in the laboratory but on a full sized dyeing machine the cooling is too slow to produce any decided effect. Perhaps the best general method, where dyestuffs of the two groups are used together is to start at a low temperature and raise it slowly during the dyeing to a point somewhat below the maximum temperature for the high temperature component. This duplicates essentially the laboratory method of starting at a high temperature and cooling during the dyeing period; the low temperature dyestuff goes on before the temperature becomes too high, and in the higher ranges the high temperature dyestuff will exhaust. In some cases it may be better to select a temperature about half-way between the optimum dyeing temperatures of the two components, and salt rather heavily in order to force on as much of the dyestuff as possible.

Where it is at all possible, it is best to avoid mixing the two groups, and in most cases this can be done by attention to the proper selection of dyestuff.

A great deal of shade variation experienced in the dyeing of sulfur colors can be traced to variations in the dyeing temperatures and, after a formula has once been decided upon, it should be adhered to rigidly. In most sulfur dyehouses automatic temperature control devices are a great help and as a rule will pay for themselves in a short time in saved steam and improved dyeing.

After the dyeing proper, some sort of oxidation is necessary on everything except the direct dyeing sulfur blues, and even these are improved by it. There are two general methods of oxidation in use, air oxidation and the so-called chemical oxidation. Where it is practicable to do so, oxidation by exposure to the open air is undoubtedly the best, but at the present time this is not possible in the majority of dyehouses on account of the construction of dyeing machinery. It is possible in skeins and warp dyeing, and, where sufficient floor space is available, in raw stock dyeing, but this method cannot be used with the package dyeing machines. With these, it is necessary to resort to the use of sodium perborate or some similar oxidizing agent. In this connection it should be noted that the oxidizing action of sodium perborate is very rapidly destroyed by the presence of sodium sulfide, and the dyeing should first be washed with cold water before oxidizing with this compound. If this wash is not given, an excess of sodium perborate is necessary. This excess is risky, as there is danger of precipitating loose dyestuff on the fiber, which results in poor fastness to rubbing and washing. Therefore, a cold wash should always be given. A great many complaints of insufficient fastness in sulfur colors can be traced to improper oxidation. The sulfur blues have a very decided tendency to bronze in heavy shades, and when once this bronziness appears it is very difficult to get rid of it without stripping the dyeing. This bronziness is very frequently caused by too rapid oxidation. In skein dyeing, it is often caused by portions of the skein remaining too long above the surface of the dye liquor during the dyeing operation. If at the end of the dyeing the plug is pulled and the dyestuff allowed to drain off while the skeins are hanging in the bath or even racked up, bronzy streaks very frequently make their appearance. This can be avoided by opening the water valve at the same time that the plug is pulled and allowing the dyebath to be gradually replaced by cold water. In fact, bronziness which is not caused by lack of sodium sulfide can nearly always be avoided by allowing the dyeing to oxidize under water, at least in the preliminary stages.

While the so-called direct dyeing sulfur blues are not reduced in the dyebath to the same extent as the others, a good oxidation is still necessary to develop the depth and brilliancy.

With regard to a chemical oxidation, it may be stated with confidence that it is never as satisfactory as an air oxidation, and there are indications in some recent work on the subject that a treatment with sodium perborate can hardly be called an oxidation at all. As many of you undoubtedly know, it has been shown that a rapid and complete oxidation cannot be obtained on the vat colors in the presence of pure oxygen or in pure air, that is, pure nitrogen and pure oxygen mixed in the same proportions as atmospheric air. The fastness is not as good, and the dyeings oxidized in this way lack their full brilliancy and depth. It has been found that the small amounts of carbon dioxide which are normally present in atmospheric air are necessary to produce a complete oxidation, the carbon dioxide probably acting as a catalyst for the reaction which takes place. In all probability some such factor is also involved in the oxidation of the sulfur dyestuffs, and this would explain the fact that the maximum fastness can seldom be obtained on either vat or sulfur colors with any type of chemical oxidation.

Next to an air oxidation, the best method is probably that of washing the dyed material for a considerable period in cold water. This will, of course, reduce the strength obtained to some extent, but usually better fastness is obtained and, in a great many dyestuffs, greater brilliancy. The reason for this is probably that water, which has not been heated, practically always carries with it a certain amount of dissolved atmospheric air or oxygen, so that what takes place is really an air oxidation, the water merely serving as a convenient carrier for the air. Water oxidation also has the advantage that the reaction takes place rather slowly, due to the small amount of air in solution in the water, and we believe it to be a general rule that the more slowly an oxidation takes place the better the results in the finished dyeing. This is the rea-

son that the sulfur blues bronze so infrequently when oxidized under water, as the chief cause of bronziness is too rapid an oxidation. The very soluble dyestuffs, however, such as the sulfur greens and the sulfur bordeaux, are likely to lose a great deal of their strength when oxidized with cold water in package dyeing machines of various types, since when the water is first pumped through the package it usually becomes heated to such an extent, and the sulfide washed out of the goods reaches such a high concentration, that it is likely to strip down the inside of the package. With dyestuffs such as these, it is necessary to fix the dyestuff quickly all through the package, even at the risk of losing some of the fastness to washing.

We now come to the most important operation in the application of sulfur colors, and to which less attention is usually paid than to any other part of the dyeing, namely, the wash. Usually, when the dyer has opened the drain valve and allowed the dye bath to run off, he has the feeling that the dyeing is finished and that, in a way, his responsibility is ended, and that the washing which follows is relatively unimportant. There is also always a temptation to cut down the washing time as much as possible in order to save water and increase production. This is a very shortsighted policy. The writer during his connection with the dyestuff industry has seen innumerable complaints of sulfur-dyed fabrics investigated, and in a surprisingly large number the trouble was discovered to be inadequate washing. These complaints covered apparently everything that could possibly happen to sulfur-dyed goods and a very large proportion of them could be traced to improper washing. Here are a few of them: Poor fastness to washing, poor light fastness, crocking, tendering, harshness, poor-running raw stock, lack of brilliancy, odor, streakiness, bronziness, shade change in finished goods, bleeding in the size box and firing in the dryers. Some of these conditions may be due to other causes, but all of them can be caused by poor washing, and are more frequently caused by this than by any other single factor. While there is an apparent saving in time and cost in cutting short the wash, it is always in the long run a most expensive economy.

Without exception, no sulfur color should be taken from the dyeing machine until it has had at least one wash with cold water and two washes with hot water, and it is better to give two cold washes, two hot washes and, on raw stock, one final cold ash containing salt.

The tendering of sulfur blacks is a question which interests everyone who has to handle them, from the dyer to the selling house. While the chemical cause of this tendering is not thoroughly understood, the consensus of opinion seems to be that it is done to the gradual decomposition of the sulfur black molecule, which breaks down slowly in such a way as to liberate minute quantities of sulfuric acid. As this acid is not volatile, it remains on the fibre and gradually destroys it, the goods first becoming slightly tender and, as time goes on, completely rotten. As far as we know at present, this decomposition is inevitable and it is impossible to stop it entirely. The best we can do is to retard it to such a degree that in normal cases the goods will be in the hands of the consumer and worn out in ordinary use before the tendering becomes sufficiently pronounced to be noticeable.

A number of things can accelerate tendering to a greater or lesser extent. High temperature and humidity will increase the speed of the reaction appreciably, and goods packed in air-tight containers will as a rule tender more quickly than those stored where there is a free circulation of air. Even extremely small amounts of copper salts in the goods will speed up the reaction tremendously, and this is equally true of one or two other metallic salts, this being the chief reason why it is never safe to after-treat sulfur blacks with metallic salts. And the factor which has the most direct bearing on the rate of tendering is the wash. No inadequately-washed dyeing of sulfur black can ever be depended upon to remain in good condition for any reasonable time. This is true for several reasons: The dye bath contains, in addition to the sulfur black, considerable quantities of sodium sulfide, sodium carbonate and salt. The salt and sodium carbonate, being very soluble and having no particular affinity for the cotton fibre, are usually rather easily washed out. The sodium sulfide is somewhat less soluble, and in addition has a tendency to attach itself to the fibre, so that it is much more difficult to remove completely. The sulfur blacks of to-day are manufactured in an extremely finely-divided state, and a considerable amount of undissolved dyestuff may be present in the dye bath without its presence being suspected. Furthermore, the oxidizing agent used, upon coming into contact with the goods saturated with the dyestuff solution, precipitates an appreciable amount of dyestuff on the fibre in an even more finely-divided state, so that quite a little dyestuff in this form may remain attached to the fibre before its presence is made known by crocking. Now as the tendering is largely caused by the decomposition of the sulfur black, it can readily be seen that the more superficially fixed dyestuff left on the fibre the greater the chances for rapid tendering. This undyed dyestuff is of no value and is likely to cause trouble, therefore, it should be very thoroughly removed. We have no definite proof that the presence of sodium sulfide accelerates the tendering, but we do know that sodium sulfide, left to itself and exposed to the air, decomposes and has a tendency in time to become acid in reaction. While the sulfide alone may possibly cause only slight tendering, it is highly likely to set up a condition in the goods favorable for the tendering action of the sulfur black molecule itself. It, therefore, appears

essential to get rid of every possible trace of sodium sulfide and loose color, and there is strong reason to believe that much of the trouble caused by tendered yarn can be by this means eliminated. Sodium sulfide and loose color are somewhat difficult to remove with cold water alone, but they are relatively easy to remove with water at a temperature of 140° to 160° F. In the case of sulfur blacks, particularly, the time and steam required to give one or even two hot washes, are well warranted by the results, and this is especially true in any kind of package machine dyeing where washing presents peculiar difficulties.

Even with the greatest care in washing, it is quite possible for a batch to slip by occasionally which is not as well washed as it should be. For this reason, it is good practice to use some compound in the last wash water which will retard the tendering action even if considerable amounts of sulfide, loose color, and so forth remain in the goods. The best substance to use for this purpose is sodium acetate, and one to two per cent on the weight of the goods will give very satisfactory results. It should, of course, be dried into the goods. Its effectiveness depends on the fact that sulfuric acid formed in contact with it is immediately destroyed, with the formation of sodium sulfate and acetic acid. The sodium sulfate is inert; the acetic acid is volatile and will evaporate from the goods, while even if it remains in the cloth its action on the fibre is much less severe than would be that of any of the mineral acids.

The other sulfur colors are not as liable to cause tendering as are the sulfur blacks, although the sulfur blues will also tender to some extent if they are not carefully washed. Tendering in any other shades dyed with sulfur colors can almost invariably be traced to some cause outside of the dyeing operation.

Occasionally, when dyeing sulfur blues and sulfur blacks, and less frequently with the other sulfur dyestuffs, on raw stock, rather frequent and apparently causeless fires will break out in the dryers. This condition is almost invariably traceable to stock which has not been thoroughly washed.

Sulfur-dyed yarns for the hosiery trade occasionally show a lack of fastness to washing and cross-dyeing. Provided the proper dyestuffs have been selected, the cause again is nearly always improper washing. If the goods are not thoroughly washed, enough sodium sulfide remains to partially dissolve the dyestuff on the fibre when it comes in contact with hot water, thus causing bleeding into adjacent white or light-colored yarn. Raw stock which is difficult to card and draw, and harsh yarn, usually represent conditions that can be remedied by thorough washing with hot water.

It is not an unusual occurrence for a shade to be a good commercial match in the dyehouse and go through the mill up to the final inspection without any apparent defect, only to be returned a few weeks or a few months later as off-shade. When the returned material is examined against the standard shade, it is found that the complaint is justified and that the shade has changed badly since the final inspection in the mill. A certain amount of change is inherent in all sulfur colors. Some of them will reach their final shade within a few hours after dyeing, and some of them may take two or three days. This fact is known and usually allowed for by every dyer working with these colors, and where the shade change is only normal no great inconvenience arises. However, at times the shade change is much greater than it ought to be, and recent work on the subject has indicated the possibility that this may be induced by leaving the goods in an alkaline condition. In other words, the goods should be sufficiently washed so that the last wash-water is neutral. We believe that it would be good practice to test the last wash-water on every dyeing with brilliant yellow paper and, if it shows alkaline on this indicator, to continue the washing until the wash-water is neutral. It is possible that an abnormal shade change can be checked by the addition of 1 to 2% of acetic acid in the final wash-water, although this point is still somewhat obscure and needs to be studied more thoroughly before a definite statement can be made to this effect. At all events, we do know that a very thorough wash will minimize progressive shade changes.

The subject of the dyeing of sulfur colors has necessarily been very lightly touched upon in this paper, but it is hoped that enough has been said to indicate the numerous possibilities for useful research in the field of application methods. We have a great deal of empirical data collected from laboratory investigation and practical experience, but we have not yet linked fact with fact in logical sequence to give us a comprehensive working hypothesis of the involved reactions of the sulfur dyebath. Instead of having nearly reached the end of our investigations of these colors, we find that we are merely making a beginning and, in order to receive the full benefit of their very useful qualities, we must examine their properties more minutely than has hitherto been done.

Warp Mercerizing

By J. H. SKINKLE

PRESENT practice in warp mercerization may be divided, for purposes of discussion, into seven stages:

1. Preparation of the set
2. Boiling out
3. Mercerization with caustic
4. Caustic washes
5. Souring or neutralization of excess caustic
6. Any further wet treatments
7. Drying.

Modern mercerization is carried out primarily for luster and hence requires tension. For this reason, the cotton mercerized should be of good quality in regard to staple and class. The yarn should preferably have been gassed before mercerization because protruding fibers would not be under tension and would receive less mercerization and because a fuzzy outline of the yarn tends to offset the increased luster.

The drafts of yarn put through the machine should be uniform in thickness and penetrability to caustic, since if one draft is thicker than another, the thinner one may be dragged over the rolls and chaffed. Best practice in this regard seems to be to use drafts of 70 to 100 lbs. per 1000 yards of length and to use not over 12 drafts in an ordinary 36 inch machine. A greater number of drafts tend to mat.

Previous to boiling out and in order to prevent this matting, a water band is wound around the drafts.

The purpose of boiling out is to remove the dirt, oils, and waxes from the yarn in order that the caustic may penetrate uniformly and completely. The cotton waxes are not saponifiable but are removed by emulsification. Practice in this regard has progressed from mere boiling water to the use of alkalies and then to the use of sulphonated or soluble oils. If a boiling out compound is used, a further boiling out in plain boiling water should be given to remove the boil-out compound. The boiling boxes should boil vigorously. Following the boiling boxes should be a box of cold water to cool the yarn before it enters the caustic. The boiling box section should be run about 3 per cent faster than the caustic section in order to put in a little slack and prevent too great tension.

There are usually three caustic boxes with the caustic flowing counter-current to the yarn. The tension in the caustic is maintained by weighted rolls, so regulated as to prevent shrinkage but not to permit chaffing. The strength of the caustic may be anything above 40° Twaddle, usually 48° to 56°, depending on the size and amount of twist of the yarn. The time in the caustic should be from two to five minutes; less than two minutes does not give sufficient time for complete saturation, although the reaction itself is complete in one-half minute; more than five minutes causes damage due to oxycellulose formation. The temperature of the caustic is a debatable point, it is possible to mercerize at the boil if a strength of caustic of 70° to 80° is used, and it is possible to mercerize with weaker caustic (about 40° Tw. or slightly less) with refrigerated caustic; general practice, I believe, is to do neither but to keep the caustic around room temperature.

There are about four caustic washes, in which the tension of the yarn should be held, the wash water flows counter-current to the yarn if the caustic is to be recovered; or if the caustic is not recovered, each box has a separate water feed and overflow. It is considered uneconomical to recover caustic from a solution weaker than 10° to 12° Twaddle. The temperature of the first wash is high and the succeeding washes are cooler; the one just before the acid must be cold.

On entering the acid, the yarn should be allowed a little slack in order to get penetration of the acid into the yarn. The temperature of the acid should be as low as possible, to avoid damage; the strength should be regulated to individual conditions, and may be anything up to 10° Twaddle. The acid should be kept as clean as possible since any impurity is picked up by the yarn and held very tenaciously; the sodium sulphate formed must also be removed as rapidly as possible to avoid slackening of the yarn.

After the acid, the yarn may be washed in successively warmer washes, in five or six boxes, until a temperature of 120° F. is reached, and then dried.

For finer goods, a typical treatment consists of:

1. A cold wash
2. A wash at 100° F.
3. A wash at 120° F.
4. Neutralize in dilute ammonia at 120° F.
5. One or two more hot washes
6. Application of softeners at 120° F.

There is room here for much argument as to whether dry cans or air driers should be used. Dry cans are cheaper to install, require less regulation but stiffen the yarn somewhat, probably due to a calendering action. Air driers are more expensive, require very close regulation (automatic control is a necessity) but give a very soft yarn; they may be operated at from 160° to 250° F. according to the type of yarn being dried. Considerable assistance in drying is given by a heavy pair of squeezer-rolls just before the drier.

Roller-bearings may be used up to the acid and beyond the ammonia and help considerably in preventing chaffing.

Squeeze-rolls are of rubber covered iron in the caustic and of rubber covered copper or brass elsewhere. Varying degrees of hardness in the rubber may be obtained and should be considered for each special case.

Individual cases and requirements vary so much that it is difficult to lay down any hard and fast rules. I have endeavored here to consider general practice and I would like to hear some opinions of practical men on special cases and problems.

Presented at Northern New England Section, February Meeting.

Discussion

M. L. Griffin: The subject of mercerization is of historic as well as industrial importance. Mercer was searching for improved methods in dyeing. In this, his success proved a failure, because of the shrinkage which he could not or did not overcome, and nothing tangible resulted from his discovery for about fifty years. Had he applied tension to regain the loss by shrinkage, he would have climaxed one of the most useful processes in all time.

It remained to Lowe in 1889 to discover how to overcome this loss in shrinkage which had been the obstacle to Mercer's success. His success brought him no rewards. Strange to say, in his eagerness to solve this problem, he was blind to the resulting fact of luster. This most important characteristic and result of the whole process was discovered by Thomas and Prevost in 1895, who were granted letters patent therefor. So important was their climacteric discovery that the process was taken up in Europe and the United States without much regard to the rights of the patentees. A celebrated lawsuit followed —The American Mercerizing Co. vs. The Hampton Company—which was tried in the U. S. District Court at Boston. Nowhere else in the literature of this subject have I ever discovered such full and complete testimony by experts, regarding all the essential elements which contribute to the best practice in mercerizing.

For one reason or another, the principles involved in the process are not generally well known or if known have not been appreciated at their full value. In the lapse of time they are often forgotten, and in the "speeding up process," the substance becomes a shadow and virtue takes its departure.

Whatever may be said regarding standardization in textile finishing, mercerizing is a process capable of standardization, and textile chemists should set about doing it for the benefit of the industry.

Mr. Cady: Do you then think that gray mercerizing is as good as white?

Mr. Griffin: I think so. My own work goes to show that as good luster may be obtained mercerizing in the gray as in the bleached condition, and with impure caustic as well as with clean, provided you accomplish the same degree of "plumping up" by effective saturation, and tension to parallel the plumped fibers. This is quite possible. Bear in mind that the whole process must contribute to a specular surface and if the surface of the fibers are over treated degrading the surface the reflection of light will not be specular. I have seen this happen in an attempt to get better results.

H. B. Burke: It may be of interest at this point to recount some of my experiences and practices while employed as bleacher and mercerizer with Renfrew Mfg. Co. This was some years ago, at the time F. U. Stearns controlled the Hansaloe Mfg. Co. and the combined processing was done at Renfrew—some 25 tons weekly. We had for mercerizing equipment the continuous yarn machine already described and also a piece mercerizer. Besides our own work, we did a great deal of custom yarn mercerizing. Much of this, I recall was 30/2 ply yarn and along staple cotton. Most of our piece mercerizing ran to damask table coverings. We also did some finishing mercerizing, that is, low grade stocks were mercerized in the piece (gray) to improve their appearance.

The equipment usually met with in United States for yarn mercerizing is U. S. Finishing Machinery Co., H. W. Butterworth & Sons, and Smith & Drum. There are a number of foreign skein yarn mercerizers, as well as domestic makes, located in the mills of the country but I will confine all references to the warp mercerizer and the piece mercerizes.

These warp machines are all essentially the same and vary only in mechanical detail which easily identifies the various makers' equipment. The general form, number of compartments and function of each has already been made the subject of Mr. Skinkle. It might be added, however, that unless much overloaded the average warp mercerizer requires between 5-10 hp., while the piece mercerizer requires 18-20 hp.

The subject of bearings was briefly referred to and my work with General Motors, Hyatt Roller Bearing Division in charge of textile activities, placed me in very close touch with this phase of construction and a great deal of work was carried on in collaboration with the builders. Roller bearings are very successful when the proper bearing is chosen. It is my opinion there could be even greater improvement by use of a self-aligning bearing. In the long run a roller bearing will prove cheaper than a plain bearing and the quality of the work is enhanced as there is no drag of the yarn over the roll in its forward movement but a positive delivery.

Something has been said also of the amount of yarn to be mercerized at one time. I remember when we first started off 10-12 ball warps was the load. Later this was increased to 48 ball warps and there were no difficulties encountered. That is, our own dyeings were successful and our customers never registered any complaints and that is the best index I know of. Of course, there is a tendency for the management to insist on production which taxes the equipment to the maximum and keeps the mercerizer on his toes to devise means to prevent faulty work. That is one point where laboratory and practical work are always at a great variance.

To those unfamiliar, I will briefly describe the Piece Mercerizer. This machine consists of a double or single

padding mangle (heavy cast iron rolls) which carry the caustic by regular padding contact to the cloth as it passes thru. It may pass thru between two rolls as in a starcher or the cloth may be brought back around the second roll and pass between the second and third depending upon the weight of the cloth and the tension desired. The rolls, you understand, are arranged in perpendicular column one above the other. The cloth passes from them into a clip stenter. I believe, it is common now to run the cloth over submerged rolls in the caustic box and then thru the padding roll as this gives a more uniform impregnation. Once on the stenter the cloth receives a voluminous spray of hot water and as it passes down the frame this is changed to cold water. Scrapers remove the excess of the washings and the cloth passes over rubber rolls in an acid cistern. This is not a detailed description, but will familiarize those who have not seen the equipment, with the essential operations. The production varies from 30 yds. to 60 yds. per min. and we have in practice, gone as high as 80 yds. per min. and obtained the very high luster that is characteristic of damask.

For finishing mercerization where low grade cotton pieces are processed to improve their appearance, much of the work is done on yarn machines. Here there is considerable contraction in width which is brought back approximately by finishing operations. There is no real or marked luster. Simply a rounding out of the fiber and a fullness imparted to the cloth which it would lack unless so processed. Other chemicals than caustic are employed to mercerize or rather impart certain characteristics to the finished cloth. Concentrated sulphuric acid was employed to give certain effects to seersucker and crepe. As may be imagined the greatest possible caution must be exercised to secure favorable results and to minimize the loss which would occur from the briefest lack of co-ordination of any part of this operation.

The essential details of mercerization with caustic are temperature of the caustic, concentration of the caustic and the degree of washing, which of course includes acid neutralization of the caustic. Laboratory study shows that swelling, shrinking and untwisting of the fiber must proceed to a high degree to obtain high luster. All these must be in balance. Caustic soda is the only chemical that will produce all three reactions in a balanced way and certain temperatures and concentrations have a marked bearing upon this. A uniform temperature is better than a cold or refrigerated caustic. We used to cool to about 40° F. by use of driven well water but a normal uniform temperature would give excellent results. It must be uniform or the work will vary. Our most uniform results as regards luster came from the use of caustic at between 40 and 45° Twaddle.

This was accurately maintained by running in caustic at slightly higher test in replacement of caustic pumped out as it reached 40° Tw.

The early stages of the washing develop the greatest tension of the yarn and the roll speed should be taken care of to compensate for this in some degree. The strong caustic wash was utilized for dissolving further caustic and for kier boiling.

The neutralization is important and this acid bath was maintained to a constant degree of acidity by titration instead of by hydrometer tests which are wholly unreliable by reason of suspended matter and the formation of sodium sulphate in the bath. It was my practice to finish the yarns on the alkaline side, as many, dyeing fast vat colors, found that a previous run thru caustic preliminary to dyeing was a safeguard toward level shades.

Various substances in the bath may tend to diminish the luster. Salt is one and we found that Monopol Oil which was used at the time to wet out would if it carried over spoil the luster. Of course all the material was first desized.

On pieces, after they were desized and washed they were entered into the caustic—that is, run in the gray. This gave no more luster than when mercerizing bleached but it did eliminate a great many stains and spots which I was never able to avoid when running bleached goods.

As already remarked, luster was not always the objective and certain low grade stocks were run to improve the yarns. Long staple cottons like Sea Island give a high luster and the caustic impregnation is about one-half minute. Low middling requires longer impregnation and the luster will be greatly inferior.

These observations of course do not cover mercerization even in a limited way but I hope they may have proved of interest and value as a supplement to Mr. Skinkle's earlier discussion of the subject.

Mr. Griffin: Do I understand that you used caustic at 40° Tw. and at 40° F?

Mr. Burke: Yes. We cooled with driven well water. Our procedure was to place the solid caustic, stripped of drum, on a grating in a tank and the spent caustic plus the first washings were used to dissolve it. From this tank the dissolved strong caustic passed thru a coil of pipe in a water-box which over-flowed with the cool well-water and hence it was drawn on to and feed into the caustic compartment of the mercerizer as degree of exhaustion required. The spent caustic being sent back to dissolve further drums, and so on, as previously described.

Mr. Griffin: I agree with you. Low temperature and concentration are functions of each other, to produce equal results. Moderately low temperatures are preferable because there is a better degree of combination of the alkali with the cellulose which is of paramount importance in the viscose process for rayon.

I do believe that yarns and cloth should be desized before mercerizing as it can be done at very little expense and the subsequent operations should not be needlessly burdened with these impurities.

Mr. Burke: Experimentation in laboratory and experience in plant shows a concentration of 40° to 45° to maintain best balance between untwisting, swelling and shrinkage.

Mr. Barnard: We can control temperature and concentration, but how can we measure luster?

Mr. Griffin: The customer measures that.

Mr. Skinkle: There has been invented abroad a machine, carrying strong claims.

Mr. Appel: Professor Pfund of John Hopkins designed a machine for measuring luster of rayon for the DuPont Co., and published in the Journal of the American Optical Society. The Bureau of Standards is interested less in luster than in strength of mercerized cloth for parachutes and airplanes.

Mr. Burke: When we started we used Egyptian cotton only, but later with lower grades of cotton, on cloth woven 36 inches and finished 34 inches wide, we found a gain of 17 per cent strength for mercerized under end tension only and bleached, versus bleached only.

Mr. Christison: Defects in mercerized yarn have not been discussed. In connection Mr. Skinkle spoke of necessity of temperature control in chamber dryers. We find that yarn darker if not heated, and progressively lighter as drying temperature rises. Dyeing particularly troublesome when mixture of yarns is used. Dry cans perhaps fundamentally wrong for yarn because of difference in treatment between yarn on surface and that next can. Yarn mercerized without tension dyes darker.

Mr. Cady: Does temperature of mercerizing bath affect dyeing?

Mr. Christison: It may be that dirt in the caustic, or impurities in the cotton are the fundamental influences, acting differently according to temperature, but at any rate higher temperature of mercerizing bath causes darker dyeings, and duller.

Mr. Griffin: In the paper industry a start has been made in vacuum chamber drying. The process is patented and several paper machinery companies have taken out rights. For paper 2400 inches in width, traveling 1000 feet per minute, the problem is far more difficult than for cotton goods.

Dr. Chapin: Such an arrangement, permitting low temperature drying, might prevent localized overheating and consequent uneven results from accidental stoppage of dry cans, or chamber dryer rolls, in various textile processes.

APPLICANTS FOR MEMBERSHIP

Active Membership

Binns, Jack W., chemist and assistant dyer, Danvers Bleachery, Peabody, Mass. Sponsors: Louis A. Olney and Robert S. Lunt.

Jackson, Thomas, superintendent hosiery dyes, Hosiers Ltd., Woodstock, Ontario, Canada. Sponsors: Charles E. Maher and B. H. Sharman.

Kelleher, Daniel J., superintendent dyeing and finishing, Toledo Dye Works, Div. Textileather Corp., Toledo, Ohio. Sponsors: John W. Kopf and Gordon M. Markle.

Key, Thomas P., salesman, American Aniline & Extract Co., F. and Venango Streets, Philadelphia, Pa. Sponsors: Paul O. May and F. H. Proudfoot.

Oesterreich, Irvin E., superintendent of dyeing, Phoenix Hosiery Co., Milwaukee, Wis. Sponsors: Paul O. May and F. H. Proudfoot.

Powell, Guy, demonstrator, Scholler Bros., Philadelphia, Pa. Sponsors: Clarence W. Wille and Carl E. Bick.

Junior Membership

Sturtevant, Fred W., overseer of chemistry and dyeing, Old Town Woolen Co., Guilford, Me. Sponsors: Ephraim Freedman and George Wolstenholme.

BENEFITS OF MANUFACTURERS' CENSUS

OF THE advantages which will accrue to manufacturers as a result of the current Biennial and Decennial Census of Manufacturers, the first and foremost probably will be the compilation of numerous preliminary reports, each of which will give figures for quantities and values of the several kinds or classes of products made within the particular industry. These reports in the aggregate will cover thousands of kinds or classes of products; and each will be published within a short time after the receipt of complete returns for the industry which it represents. The preliminary statistics will show the increase or decrease in output of each commodity, so that the individual manufacturer can easily determine whether he is getting his share of the business—whether he is holding his own, or gaining, or losing, as compared with his industry in general.

In addition, the preliminary reports will show the ratio between cost of materials and value of products, the output per wage earner, and the ratio of wages to value of output, thus enabling the manufacturer to compare his own ratios with those for the industry as a whole. The census will answer the question whether the manufacturer is paying too much for his materials, and whether his output per wage earner is too small.

But if these preliminary reports are to be of maximum value, the manufacturers must co-operate with the Bureau of the Census by making their returns promptly and by taking care to answer correctly and completely all questions that apply to their operations. Heretofore it has been the practice of the Bureau to correct and complete defective returns through correspondence before issuing the preliminary reports. This necessarily resulted in delay amounting to four or five months in some cases, and, therefore, in order to reduce the delay to a minimum, it is planned to compile the preliminary reports of this census from the returns as received, with little or no editing or verification of doubtful items, except in the cases of the earliest returns. The final reports, however, will not be prepared until the defective returns have been corrected and verified in the usual manner.

In the final reports will be presented detailed statistics showing, among other things, the cost of productive and of non-productive labor, the increase in the employment of women in industry in recent years, the number of hours of labor per week for individual wage earners; the migration of industries from State to State; the quantities and cost of principal materials and of fuel consumed; and the power-plant equipment.

In an effort to make the questionnaire easy for the manufacturers to fill out, the inquiry in regard to sales made during the year has been substituted in this census for the former inquiry calling for data on production during the year. Correct statistics on production are preferable to statistics on sales, but the Bureau realizes that many manufacturers have actually been reporting their sales and not their production, and it was decided, therefore, to ask what can be undoubtedly obtained from all manufacturers, rather than for what only a part of the manufacturers could and would report. In a few cases, however, the former inquiry calling for data on production has been retained at the specific request of the industries concerned.

During this Census of Manufacturers, the Bureau plans to compile county and city statistics which will be of somewhat greater value to local interests than those heretofore published. Separate compilations for the sixteen great groups of industries or for combinations of these groups will be tabulated for each industrially important county and for groups of contiguous counties of less industrial importance. For cities having 100,000 inhabitants or more, the industries for which separate figures cannot be shown without disclosing the data for individual establishments will be presented in a number of combinations instead of in a single group.

The preliminary county and city summaries giving combined figures for all industries taken as a single group will present the following items of information:

Number of establishments.
Number of wage earners.
Wages paid.
Cost of materials, fuel, and power.
Value of products.

In response to a demand for manufacturers' statistics covering "industrial areas," the Bureau also will attempt at this census to compile figures on such areas, each consisting of a city of industrial importance and adjoining surburban and trade territory regardless of political divisions. For certain reasons arising from the necessity of presenting the statistics in such a manner as to avoid disclosing the data for individual establishments, the Bureau will not compile figures for individual industries for a city and also for the industrial area including that city. It is the intention, therefore, to tabulate statistics for individual industries for important industrial areas but not for the included cities. In the cases of the less important cities having 100,000 inhabitants or more, statistics by industries will be published for the cities themselves but not for industrial areas including the cities.

Combined summary statistics covering all industries, however, will be published for both the industrial areas and the cities, so that it will be possible in all cases to determine the proportion which the amount of manufacturing in a given city constituted of the total for the industrial area of which it forms a part. For example: The statistics might show that three-fourths of the total number of wage earners and four-fifths of the total value of products reported for an industrial area were contributed by the central city.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile School
Directing Editor

WILLIAM HOWES COLLINS
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

A. P. HOWES, President E. S. PREDMORE, Secretary

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XIX March 31, 1930 No. 6

THE TARIFF—THE FINAL PHASE

BECAUSE the present tariff legislation has been so distressingly slow in its evolution, with the accompanying uncertainty to business and consequent retardation especially unfortunate at just this time, a sigh of relief went up when final action was taken by the Senate. Of course, the final chapter in this matter of political and economic history had not yet been written, but the determinative stage had been reached. For this much, due gratitude may be expressed.

Until "finis" is recorded, business will continue to tread its path with special deliberation. That must be expected. Still, much more is known now than has been known hitherto. Whatever opinion on individual schedules may be—and there is plenty of opinion—any deviation in the rates on which the House and Senate differ cannot go beyond certain limits. The Conference Committee of both Houses, which has now the problem of reconciliation before it, cannot fix rates above the maximum or below the minimum of schedules individually favored by either the House or the Senate.

The pious hope is that this work of the Conference Committee will not last more than six weeks; there are some very optimistic observers who predict that the time required will be less. It may be that either the Senate or the House conferees, or both sets of conferees, will have to return to their respective bodies for instruction. Certainly there still are many possible pitfalls to progress, and decisive votes especially in the Senate yet to be reckoned with. But, with the bill in the conference stage, there can be reasonable expectation that the end is in sight and that a measure will go before the President for either his approval or the reverse.

So long as the tariff is in politics, there will be lobbying, trading, and logrolling. That is part of the tariff price. But it may be that as this is more clearly understood there will be increased demand for more science and less politics in the adjustment of schedules.

EMPLOYEES AND SAFETY

THERE is great satisfaction in noting the immediate response to the "Industrial Safety Campaign" which started on the first day of the month. Any doubt as to whether the industrial organizations might enter into the spirit of the drive was dissipated the very moment that the figures showing the number of entries became available. The response was even greater than that for which it had been hoped. Now with the eyes of the country focused on the results of this particular campaign it is reasonable to expect that the effort toward minimizing accidents in commercial plants will continue long after the period officially designated by the Merchants' Association of New York.

In the actual meeting of the problem there appear to be two central factors, both of which are of almost equal importance. The first of these comes in the reduction of the hazards which imperil the worker. The second is in the education of the worker himself to look out for his own safety—the preservation of life and limb. It is essential that neither of these sides be neglected, for although one may bridge the gap temporarily the chances are very much against its complete success without the aid of the other.

The Metropolitan Life Insurance Company in one of its series of pamphlets on Industrial Safety has treated the question of "Workmen's Safety Committees." There has been made a complete analysis of the situation in an effort to develop methods to reach the workman in order to encourage his interest in his own safety. It appears that in practically every case where there has been experimentation in giving at least part of safety responsibility to the employees, the plan has enjoyed admirable success.

The size of the committees varies in accordance with that of the plant, but the duties of the committees are virtually the same. The management of a plant where the employees' safety committee is in operation endeavors to keep in close touch with the committee and act on its suggestions to the utmost extent. There are frequent meetings at which the various committee members report their discoveries and give their solution to problems. An accurate count is kept of all accidents of both minor and serious nature. Reports are always filed and recommendations made through this impartial medium. All property is inspected at regularly designated intervals and immediate steps are taken to rectify any unsafe devices or practices that come to light on these comprehensive tours.

Then as a last duty the committee takes upon itself to spread the idea of safety among the workers and thus to gain the wholehearted co-operation. Any erroneous no-

tion that the employer is not sympathetic to the needs of the men is quickly dispelled. Bulletins are displayed illustrating pictorially how accidents may be lessened, first-aid equipment is maintained in convenient places, and proper recognition is always forthcoming for any worthwhile suggestion on the part of any employee. A truly remarkable power is created and good will is formed by this voluntary exchange of ideas on the part of both employer and employee.

Random Thoughts on Research

The Approach Via Information

A VAST amount of information on all sorts of scientific and technical textile matters has been recorded in published form, but much of it is in foreign languages or in out of the way places. A great deal of this material would be useful in the mills or to the research program if it could be put in usable form. Therefore a complete study of the literature should be made and it might very logically precede active experimental research.

In many instances enough good information is already extant to provide tentative standard mill methods which would even now be better than the actual practice in some plants. We are inclined to belittle the science that has been applied to textiles when confronted with the vast amount that could be done, but actually a vast amount has already been done that is nowhere nearly fully utilized.

The need is not merely for new knowledge but almost equally for a fuller use of what we already have. If the available and reasonably reliable known science and technology of textiles could all be reviewed, and organized into usable form the result would be astonishing; and if it could be applied in actual manufacturing throughout the industry we might have right there the most impressive argument for ad-advanced textile research.

The great difficulty now and at any future time is to get people to pay attention to what is for their own good.

Coming to the current world-wide textile literature, undoubtedly the collection of information and its redissemination in more available form is one of the greatest services that a research organization can render. Neglecting for now the question whether we should have one large research association for all of textiles or smaller ones for each fiber, we all have to admit the importance of a library. The Textile Research Council also has recognized this as a good starting point for research.

A large central library specializing in textiles is the ideal, and is to be sought if it can be fitted in with the rest of the program. It would be equally valuable to chemists and research men outside of any research institutes.

A library can provide a very valuable information service if a real effort is made. Abstracts of textile literature are available now but the library could no doubt cooperate to make them better and perhaps more widely distributed at a moderate cost to the subscriber. That is a matter of detail. To be of most value abstracts should be issued promptly; those covering new material should be quite full in order to meet the needs of a great variety of readers, especially if they are from foreign publications. Abstracts can indicate what is in articles and that is perhaps their main function, but frequently the point that may be most important to an individual worker is some side issue or by-product that the abstract may not even mention. The research worker wants to read the original articles, himself, that concern his special field most closely; and some who are not in research would very frequently like to obtain original articles here and there in a great variety of textile publications that they cannot afford to take.

Here is opportunity for real service. Let the library have as complete a file as possible of journals relating in any way to textile technology and science. Let it also have extra subscriptions from which single copies can be loaned for a reasonable small fee, so that any individual or research group can get the less common material while it is new, or after it has been suitably filed as part of a circulation service, without risk of breaking up the main library collection.

A general information service for answering inquiries would also be necessary and very valuable.

Reviews could be written in anticipation of research work. Most excellent examples have appeared in the Journal of the Textile Institute during the last few years. Some of them would be of very general interest but some of those that are more specialized might better wait for a plan of research or a definite need, and be compiled by those who are to use them. The proper system may be a general review and indexing, followed by more specialized study.

The technical and patent literature is full of things that have been discovered anew, over and over again. There may still be something to them and our more modern knowledge may make them useful, as we may as well have them summarized, know what has already been done and perhaps save a lot of time and trouble.

The possibility of these information services should be one of the main points of interest and appeal to the chemist or other scientist already engaged in textile work.

Rug and Upholstery Cleaning

By **GEORGE H. EDWARDS**

WHEN a little chick releases itself from the egg shell, it at once commences to feed from off the ground. However, because its tiny legs are so weak, it cannot accomplish very much by scratching, so it has to content itself by picking up tiny particles from off the top of the ground. It no doubt supplies its requirements for food in this manner as a chick, but as it becomes larger and larger, its need for a greater volume of food becomes necessary. However, at the same time its legs become stronger and stronger and it no longer is contented with plucking its food off the top of the ground, but it does exactly as the mother hen, and goes slowly over the ground clawing or scratching the earth in an effort to get down a little deeper for a greater supply, or more choice morsels.

* * *

I suppose you are wondering what this has to do with rug cleaning. Well, it has been claimed by many that those in the rug cleaning business have only received about 10 per cent of the rug cleaning business that there is to be had, and if this is a fact (and I believe that it is) then the rug cleaners, or most of them, have been like the little chick and have only been plucking off the top of the ground, whereas they should be like the grown hen and claw or scratch a little deeper in order to increase their volume of business, providing of course that their plants are able to handle a greater volume.

This clawing, scratching or digging, call it what you may, is accomplished through the medium of constant advertising on the part of the progressive rug cleaners, and then only as the result of the proper kind of advertising, educational publicity, followed by rendering to the public the very highest quality of cleaning service after receiving the work, and not by rendering to the public the surface washing camouflage quality of cleaning so commonly practised by the majority of rug cleaners in the past.

While there may be some rug cleaning establishments that already have developed their rug cleaning business to such an extent that the volume during the peak of the cleaning season just about taxes the capacity of their plants, and it would be impossible for them to handle properly a greater volume without enlarging their plants, I do not believe that this holds true of the majority of the rug cleaning plants.

It is my object to call to the attention of the rug cleaners another avenue or source of supply for additional business other than rug cleaning, which can be easily handled by them, both in the busy and dull period, particularly the dull periods. I refer to the cleaning of furniture and automobile upholstery.

Every home has some upholstered furniture, and there are thousands of automobiles in existence. The upholstered materials of these become soiled and require a cleaning just as do carpets and rugs, and carpet and rug cleaning establishments are in most cases properly equipped to clean them; in fact, there are many rug cleaning plants that already have taken advantage of this opportunity that exists and are increasing their sales considerably by advertising that they do this kind of cleaning and receiving considerable of this work. However, a far greater volume of this kind of cleaning could be stimulated if the public was aware of the fact that rug cleaning plants did this sort of work.

From an investigation I have made, I find that among some rug cleaners who are cleaning upholstery, furniture and automobile upholstery, that they are doing the cleaning by the naphtha or so-called dry cleaning process. That is, they are not removing the material from the furniture or coach and washing it in the regular way in gasoline, but are saturating a cloth with gasoline, or carbon tetrachloride or solutions made from these combinations, and are rubbing the material with it. It is needless for me to tell you what a dangerous process this is, many serious explosions and fires have resulted from cleaning fabrics in this manner in homes and elsewhere, and rug cleaners ought not to take these chances. While carbon tetrachloride does not burn or explode, still it too is very dangerous in another manner. If large quantities of it were used in a poorly ventilated room, its fumes would take the lives of those in that room.

However, I have found that more rug cleaners are cleaning upholstery materials by the wet or shampoo-cleaning process than they are with gasoline and other dry cleaning solutions, and it is because of the fact that I have found that they were cleaning these fabrics by hand, and with a scrub brush, and with either a liquid soap and water solution or a soap cleanser in a jelled form, in a similar manner that they clean carpets or rugs which, according to my findings, is the wrong method of application. After con-

siderable experimenting I have found a better method of cleaning upholstery materials by the shampooing process.

Many of us know that some of these upholstery materials are very sensitive to the free application of soap and water, which affects the colors, and to apply them to these fabrics in that manner might cause an injury, still these fabrics become soiled and must be cleaned. As it is impossible to remove the material from the frames, or at least not economical to do so, in order to dry clean them in the regular way, and because cleaning them on the frames by rubbing them with dry cleaning solutions is dangerous, and further does not clean the materials satisfactorily, and because of the fact that rug cleaning establishments will no doubt continue to clean these materials improperly by the wet or shampooing process, I intend to demonstrate the method that I have found works out very satisfactorily.

Just as a most satisfactory cleaning job can be made upon rugs by the shampooing process when it is properly done, without causing any injury, so can a most satisfactory job be done upon upholstery materials providing it is properly done. It is simply a matter of procedure, and the exercising of caution and care in the operation. I do not ask you to accept my methods as the final solution for cleaning these materials, unless after an investigation of the method and an examination of the cleaned materials you have found that it has merits worthy of at least being tried, or until some one can instruct us in a better method.

With few exceptions, the materials in either furniture or automobiles are very similar and the nature of the soil that they contain is more or less similar to that which is contained in carpets or rugs. However, these materials do not contain the volume of soil that carpets and rugs contain, nor does it become so deeply imbedded and require the amount of agitation to remove it from the fabric as do rugs. Further, upholstery materials are rather light fabrics and very flexible, and too great amount of agitation, such as would result from scrubbing them with a stiff scrub brush, would have the tendency to injure the material.

Upholstery materials should never be made soaken wet, such as they would become if a liquid soap and water solution were used, or a quantity of water were applied, such as in rinsing. For this reason it is not advisable to use a soap solution of a jelly consistency because a soap in this form would become so imbedded in the material that it would make rinsing necessary.

I have often stated in the cleaning and laundry journals, that whenever rugs were washed with soap and water, and particularly with a cleanser of a jelly consistency, that the fabric should be thoroughly rinsed free from the soap cleanser and the soil that it contained, if the rug is to be made thoroughly clean and to prevent gradual invisible injury. However, in the case of carpets and rugs, they require considerable more soap, and considerable more agitation than do upholstery materials.

In this demonstration I will show how upholstery materials can be cleaned with soap solution, without any agitation to the goods, and without leaving any traces of the soap and without saturation of the material.

The first step in the cleaning of upholstery materials is to extract as much of the dust from the fabric as is possible. This is accomplished by beating the material gently with the flat side of a long whisk broom, or wooden paddle to loosen up the dust. This is followed by going over the entire material with vacuum machine using the 3½-inch vacuum tool and passing it rapidly over the goods so that the material does not get drawn into the slot and cause a strain on the goods. For getting into corners or depressions a flat nozzle is employed, or a still better method is to use compressed air.

The shampooing solution is made in the following manner: Dissolve into two gallons of lukewarm water 1½ ounces of a combination of pure cocoanut and olive oil soap. The reasons that I specify this particular kind of soap is because they are pure vegetable oil soaps and because they produce an abundance of light, fluffy suds (which you will find is necessary in the process I shall demonstrate). To this you add one ounce of glycerine, one ounce of denatured alcohol, one-half ounce of chloroform, one-half ounce of ether and two ounces of borax.

Beat the solution into a rich suds, then submerge a sponge into this solution, squeeze out the excess water, and with the sponge filled full of this suds proceed to do the cleaning. The cleaning with the sponge is accomplished by beating the sponge against the material. This action forces the suds through the material and at the same time creates a sort of vacuum which has the tendency to withdraw the soap together with the soil that it has dissolved from the fabric into the sponge.

A couple of pails of lukewarm water should be at hand in which to rinse the sponge after shampooing a certain small section of the material. Squeeze the sponge free from the water and again submerge it in the cleaning solution, and proceed as before.

Do not rub the sponge on the material, but follow the daubing or beating action as directed until the entire material has been shampooed. Now, take a heavy Turkish towel and submerge it into a pail of hot water, wring it out so it is free from water and rub over the entire material lightly with it, rinsing the towel out in the hot water from time to time. The object of this operation is to remove from the material by absorbtion such soap as exists in the material.

Now, go over the entire material with the vacuum, passing the vacuum tool over the material evenly, but

quickly, so that the material does not become drawn into the vacuum tool slot. Have a pail of 3 per cent acetic acid solution cold, made up, and submerge a Turkish towel into this and wring out tightly, and again go over the material lightly. By lightly I mean that the material may be rubbed back and forth with the Turkish towel, but not with much pressure. The acetic acid solution acts as a color reviver.

Again go over the material with a Turkish towel that has been wet with hot water and thoroughly wrung out. Follow by submerging a towel into denatured alcohol and wringing it out tightly, sponging the material very lightly with it.

Now, with perfectly dry Turkish towels rub over the entire material to dry it up as much as possible, then brush the material in its proper direction lightly with a whisk broom, and the cleaning operation is completed.

Now, here is the explanation of the process: The cleaning solution was built up from mild vegetable oil soap stock, and the detergents that were incorporated were themselves very mild in their action. However, it must be borne in mind that the liquid solution was not applied to the material at any time during the cleaning operation, but simply the light fluffy suds, thereby modifying the detergent strengths considerable. Furthermore, because no excess soap was deposited in the material as can be realized, the material did not require any free water rinsing, but what little soap that was put into the material was removed by the rubbing of the material with the dampened Turkish towels, and considerable of the moisture that the material contained was extracted by the vacuum and the rubbing of the material with the dry Turkish towels.

After the material has been cleaned it can be placed in the regular dry room where in heat not in excess of 110 degrees it will dry out within an hour. However, I have found that if allowed to dry more slowly in the open air, but not exposed to the sun, the materials look much better.

After the materials have dried, they should be brushed back and forth with the whisk broom, again vacuumed, and if the material has a pile such as velour, it should be given a quick shower of live steam, done with a steam hose, being careful not to come too close to the material with the steam. Now, brush the material and you will have produced an excellent job.

Whenever materials have become so soiled that a sponge does not supply sufficient agitation to remove the soil, the cleaning can be done with a silk finishing brush. The brush is dipped into the solution and the excess liquid shaken out and the brush applied to the material with a back and forth beating action the same as with the sponge.

If any of the cleansing solution gets upon the polished woodwork of the furniture, it should be wiped off at once, and after the material has dried, the woodwork should be polished with some good furniture polish, following the direction given on the preparation.

If it is desired to moth-proof the upholstery material, this should be done after the material has been cleaned in the manner described.

Presented before the Rug Cleaners Institute Convention at Sherman Hotel, Chicago.

Recent Literature

TEXTILE SAFETY CODE

Bulletin No. 509, U. S. Bureau of Labor Statistics, Sponsored by National Safety Council. 20 Pages.

The Textile Safety Code was formulated by the Textile Safety Code Committee of the American Standards Association and is published in full in this pamphlet. As it takes up the matter of rules in regard to the safe handling of bleaching, runs, mercerizing and tenter frames, dyeing jigs and padders, calenders, hydro-extractors, drying cans, dye kettels and vats, and the handling of acids and alkalies, it will prove of interest and value to many readers of the REPORTER. In addition this pamphlet contains a five-page list of other bulletins published by the Bureau of Labor Statistics.

MERCK'S INDEX

Merck's Index. Fourth edition. 585 pages. January 1, 1930. An Encyclopedia for the Chemist, Pharmacist, and Physician. Bound in Fabrikoid Leather. Subscription price $5.00. Discount of 50% to members of and those affiliated with the Chemical, Pharmaceutical, Medical, and allied professions. Published by Merck & Co., Inc., Rahway, N. J. Giving the names and synonyms; source, origin, or mode of manufacture; chemical formulae and molecular weights; physical characteristics; melting and boiling points; solubilities; specific gravities; medical action; therapeutic uses; ordinary and maximum doses; incompatibilities; antidotes; special cautions; hints on keeping and handling, etc., of the chemicals and drugs used in chemistry, medicine and arts, together with an appendix containing: reactions of the more important alkaloids and glucosides; characteristic reactions of acids, bases, metals, and salts; table of atomic weights; thermometric equivalents; specific gravity tables; metric conversion tables, and abbreviations.

Merck's Index needs no introduction to those who have used it in the past, and they will welcome this fourth edition which is the first that has been published since 1907. In scope it has been much enlarged and much of the text of the former editions has been replaced with newer and more important material. The publishers are particularly anxious that it will meet the needs of students, apprentices and the young men just entering their professional career.

L. A. O.

Technical Notes from Foreign Sources

Differentiation Between Viscose and Cupro-Silks

Otto Ruenzi—Kunst-Seide 11, 158 (1929).—This problem is one which occasions the greatest difficulty, since at present very fine titers of viscose are being produced. The thickness of the individual fibres of this fine viscose is already approaching that of the silk spun under tension, i.e., of cupro-silk spun by the tension-procedure. Cupro-silk, and above all, Bemberg silk, is the one artificial silk which in its individual titer is most closely allied with natural silk.

The differentiation between viscose and cupro-silk was formerly an easy task, since between the individual titers such a great difference existed, that with the aid of even weakly magnified optical instruments the two kinds could be clearly distinguished. (Viscose and nitro-silk are, of course, easily distinguished by the sulphuric acid-diphenylamine test.) To-day, however, more exact means of distinction must be employed, and there are only two possibilities: the chemical and the optical, tests.

(a)—The chemical test. Raw viscose and raw cupro-silk are each immersed in solution of "Pelican Ink No. 4001," left immersed for a few minutes, then thoroughly washed. Viscose is thus dyed only light blue, cupro-silk deep blue. If any doubt exists, it is only necessary to repeat the test with samples of the materials, of known origin, for comparison. In the case of dyed material, the silk must be first stripped, as follows: a solution of sodium hydrosulphite is prepared, to which is added a few drops of an ammonium chloride solution. The dyed material is boiled in this stripping-solution until the color is discharged, or has at least become so faint that the test with Pelican Ink can be successfully carried out. The material is then thoroughly washed, and tested as just described. If any doubt exists after even comparative tests upon known material, we must resort to the optical method of examination.

(b)—The optical test. We know, of course, that cupro-silk, in order to be obtained of sufficiently great fineness, is stretched during the spinning process, and so is almost perfectly circular in cross-section. Viscose, on the other hand, through shrinking during the hardening of of the cellulose filament in the spinning process, becomes crumpled more or less lengthwise, and its cross-section, therefore, differs greatly from that of cupro-silk. The edge of the cross-section of cupro-silk is evenly circular, that of viscose distinctly (irregularly) toothed.

A further distinction, easier to observe than the above, since it is not easy to prepare cross-sections for microscopic study except in a well-equipped textile laboratory, is furnished by direct examination of the fibers in the ordinary microscopic way (i.e., mounted lengthwise). It has been mentioned above that cupro-silk, being subjected to stretching in its synthesis, possesses a smoothly-circular cross-section. Under sufficient magnification, this form would correspond to a smooth glass rod with circular cross-section. If light passes through this rod laterally, we can perceive in the middle of the rod a bright line, for here the light is passing through in a straight line (not refracted); on each side of the middle portion the light is partially deflected and considerably refracted by the curved surfaces, and so along the later portions of the rectangular outline of the rod darker areas are visible. Exactly the same phenomenon is evident with smooth, cylindrical cupro-silk fibers. It is quite otherwise when we look at a glass rod which is fluted. In such a case the light passing through is diffused according to the situations of the striations; the darker areas only along the side are no longer visible; they are perceptible at any place on the rod, depending upon the situation of the flutings. To such a fluted rod does viscose fiber correspond, for this fiber does not possess the circular, but fluted, or serrate, outline in cross-section, and the flutings are of rather unequal width and separation. Observation of such a fiber must bring to notice the same appearance which the fluted glass rod would display. To summarize—viscose silk under the microscope displays longitudinal bright lines and shadows within the boundaries of the separate filaments; cupro-silk shows only clear light between the edges of the filament, shading off into darker areas on each side of the bright median streak. This is true for ordinary viscose. For hollow viscose, the so-called "air-silk," only a cross-section can decide.

As to these cross-sections, the Reichert Optical Works of Vienna furnish an apparatus for observation of the cross-section of fibers in situ, so to speak, i.e., smoothly-cut ends of a bundle of the fibers in question, without its being necessary to make actual microscopic cross-sections, which must then be mounted in some medium upon a glass slide. The apparatus, a small affair, consists of a metal bed-plate 5 by 10 cm. long, upon which is mounted a tiny reflecting glass prism optically worked. A tiny groove directed against this prism is laid a prepared bundle of the fibers to be examined, which is thrust against the face of the prism and then sectioned squarely across with a sharp razor; the cut-off end is blown or brushed aside, the clean-cut end of the bundle pushed against the face of the prism, and the section observed under the microscope, on the stage of which the apparatus is placed

when the "section" has been prepared. A powerful beam of light from any suitable source is used to illuminate sufficiently the cut end of the bundle. The cross-sections are thus observed directly in situ in the bundle, by direct and not transmitted illumination. The apparatus costs only about 15-20 RM., and makes it possible to have the cross-section ready for study in about 5 minutes after starting. Collodion is a suitable imbedding material.

Physical Properties of Acetate Silk

H. Brandenburger—Kunst-Seide 11, 144 (1929)—The second part of a series of papers on the general subject of acetate silk dyeing. This present part deals only with the physical properties of the fiber—its density, luster, fulness, optical properties, chemical reactions, action of solvents and swelling agents—several illustrations, tables, and graphs.

Behavior of Certain Dyeings in Contact with Hot Metals

Prof. R. Haller—Mell. Textil-Ber. 10, 373 (1929).—An interesting paper, of theoretical nature, from the physico-chemical side.

Quantitative Determination of Oxycellulose in Bleached Cotton Goods

W. Minajeff and A. Medwiediew—Mell. Textil-Ber. 10, 376 (1929).—A paper from the quantitative-analytical side, not altogether in agreement with results of Kauffmann (Mell. Textil-Ber. 6, 591, 1925). Dr. Kauffmann replies to the implied criticisms of M. and M. in a short rejoinder following (p. 378), pointing out the reasons for M. and M.'s values differing from his own, and adding what it is well to remember more clearly than we sometimes do, that "Oxycellulose possesses no clearly defined chemical formula," i.e., that we use the term generically too often, as though oxycellulose were a definite, "einheitlich," compound, of definite chemical and physical properties.

Adipic Acid and Its Derivatives in Textile Chemistry

Dr. W. Obst—Mell, Textil-Ber. 10, 383 (1929)—Adipic and methyl-adipic acids are very promising substances, owing to their capability of being substituted for the poisonous oxalic, and the expensive tartaric, acids. They are now being produced on the large scale in Germany, and so cheaply that they can compete favorably with the longer-used acids mentioned. Their esters are valuable as binders in printing-pastes (preparations of them are on the market under the name "Sipaline"). The acid esters (adipic and methyl-adipic acids are dibasic) as ester-salts are emulsifying agents of great dispersive power, as great as that of Turkey-red oil. The glyceryl esters and esters with other poly-acid alcohols, are of high value in finishing.

Bleaching of Artificial Silks

K. U.—Kunst-Seide 11, 162 (1929).—If yarn is being dealt with, the chances are that the fiber is still more or less coated with fat-emulsions from the spinning. These emulsions must be removed in order to be able to bleach properly. The silk is therefore treated with good Marseilles soap, if necessary with addition of Turkey-red oil. The bath-strength is 5-10 g. of soap per liter, treatment ½ hour at 60°-80° C. The goods are then well rinsed, after which they are ready for bleaching with peroxide, hypochlorite, or chlorine (3 g. active chlorine per liter).

In the case of woven goods, the presence of warp-finishing must be reckoned with. The removal of the finishing-agent must be very carefully carried out, in order not to involve the hydralized cellulose of the silk in the hydrolytic action of the enzyme. The bath should, therefore, be no stronger than is absolutely necessary—about 2% of the weight of the goods, at 65° C.

As far as any acid is required in any treatment, acetic acid is preferable to any stronger ones.

Dyeing or Printing with Vat Dyestuffs

Durand-Huguenin, Basel—English Patent No. 281,336.—The cotton goods are padded or printed with a solution of a sulphuric ester-salt of a vat dyestuff, containing glycerol, tragacanth, sodium chlorate, ammonium vanadate and mono-chlorhydrines or similar compounds which split off acid in the heat, such as dichlor-hydrine, chlorethyl alcohol (ethylene chlorhydrine), potassium methyl—or ethyl-sulphate, etc. After drying, the goods are steamed for 10 minutes, washed, soaped and dried.

Dyestuffs of Rhodamine Type

Imperial Chemical Industries, Ltd.—English Patent No. 303,243.—The amino-phenols or their derivatives (except the ethers) are condensed with dihalogen derivatives of fluorescein, giving bases which by sulphonation with monohydrate at 80° C. are converted to acid blue dyestuffs. Similar but more yellow products are obtained by condensing dihydroxy-diaryl-amines with phthalic anhydride, and subsequently sulphonating as before. All the products dye wool in tones fast to light, acids, stoving, etc.

Wetting-out Agents

Soc. Th. Boehme A.-G.—French Patent No. 654,624.—The agents specified are heterocyclic bases, sulphonic acids of cyclic hydrocarbons with an aliphatic radical substituted into the nucleus (particularly such of the naphthalene series), or similar compounds of heterocyclic nature.

Turkey-red Analogues

Soc. Th. Boehme A.-G.—French Patent No. 654,108.—The substances cited are prepared by treatment of suitable oils or fats, or of the acids derived therefrom, with concentrated sulphuric acid in the presence of acid anhydrides or chlorides, organic or inorganic, or of very concentrated organic acids, the sulphuric acid being used in excess, and strongly chilled. The object of the patent is the employment of such products in alkaline baths, particularly those containing caustic, wherever such are used.

(*b*)—(*Same subject and grantee, French Patent No.* 654,386).—Compounds prepared as in the preceding are recommended for use in finishing preparation.

E. & F. King and Company to Represent General Chemical in New England

The General Chemical Company have recently announced to the trade that they will be represented in Massachusetts and Northern New England territory through E. & F. King Company, Inc., of Boston. This will offer a new market to General and the news is expected to be very well received by users of heavy chemicals in that section.

E. & F. King have been in the chemical field since 1834 and their stock houses in Boston, Providence and Salem will facilitate the rapid delivery service of this new line.

Textile Institute and Style Show

The Textile Institute and Style Show conducted annually by the Textile School of North Carolina State College, will be held on April 9 and 10, in Raleigh, North Carolina. I. L. Langley, a graduate of the Textile School, who is assistant general manager of The Consolidated Textile Corporation, Lynchburg, Virginia, will deliver a series of lectures on "Calculating Individual Fabric Costs."

A Style Show will be held on the afternoon of April 10, at which time the young ladies of the Home Economics Departments of The North Carolina College for Women, Greensboro, N. C., Meredith College, and Peace Institute, Raleigh, N. C., will take part. The dresses worn by these young ladies will be made as part of their regular classroom work from fabrics designed and woven by textile students in the Textile School.

Quaker City Booklets

The Quaker City Chemical Company is sending out to its customers and any others who might be interested, on request gratis, a very handy pocket size booklet of information, not only concerning its own products, but covering subjects of interest to textile manufacturers, such as yarn tables, hosiery sizes, and information regarding spinning, weaving, sizing, dyeing and bleaching.

These booklets may be had by requesting same from the Knoxville, Tenn., office and plant at 934 North Sixth Ave., or the main plant and offices at 2738 North Broad Street, Philadelphia, Pa.

Millinery Colors for Summer, 1930

According to an announcement made recently by Margaret Hayden Rorke, Managing Director of the Textile Color Card Association, the Color Conference Committee of the Eastern Millinery Association and allied millinery interests in cooperation with the Association, has chosen twenty-three (23) colors for special Summer promotion.

Twelve colors have been selected from the 1930 Summer Card just issued, and the ten shades appearing on the Spring cards, which were among those previously recommended by the committee for Spring promotion, have been re-indorsed because of their continued fashion importance.

General Dyestuff Colors

The General Dyestuff Corporation has recently sent out a circular for Celliton Fast Rubine B Pdr., a new dyestuff for acetate silk which is represented as a very full bright red filling a gap in the range of their Celliton colors. It is claimed that the product shows very good fastness throughout when applied in the usual way.

There was also announced a new top chrome color, Acid Anthracene Brown PGA manufactured by the General Aniline Works, especially recommended for leaving white silk effects clear even when dyed in full shades. According to the circular the color shows a very good fastness to light fulling and potting; it dyes level and is suggested particularly for the men's wear industry as soft shades or in combinations. In addition to this product of the General Aniline Works is another by the same manufacturer Indanthren Black EBA which corresponds to the imported type Indanthren Black BB. It is claimed that it dyes from a caustic hydrosulphite bath a dark green which by treatment with chlorine turns into a bloomy shade of black of excellent fastness to light, washing and chlorine. This product is offered in both paste and powder form, the latter possession three and a half times the tinctorial strength of the paste.

The same corporation has sent to the trade a circular of their domestic production of Algol Orange RFA paste fine which is identical, so it is stated, with the foreign Algol Orange RF.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Master Vat Dyer on Cotton, Rayon and Pure Silk Skeins, embroidery threads; can also dye Direct Acid Sulphur and Basic colors. Wants position. Very best references. Classified Box No. 595, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Dyestuff and Specialty Salesman with fifteen years' selling experience and following in the Mid-Western section desires connection with manufacturing concern as Western Representative. Reply to Classified Box No. 596, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

PURCHASING AGENT

Purchasing agent for textile mill, at present employed, desires new connection. Extensive experience and excellent references. Address: Classified Box No. 597, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.